INDIAN FAR

Vol. III **New Series No. I**

EDITOR'S PAGE AND EDITORIAL NOTES .. ..
MAN OF THE MONTH (FEATURE ARTICLE)—Harkirat Singh
THE ROOT, STEM AND TOP BORERS OF SUGARCANE AND TH METHODS OF THEIR CONTROL—E. S. Narayanan .. ..
"KILL THE FLY!" .. ..
HINTS ON THE CARE, MAINTENANCE AND REPAIR OF AGRICUL-TURAL IMPLEMENTS AND MACHINES—D. N. Kherdekar ..
GROW BERSEEM AND ENRICH THE SOIL—C. N. Acharya ..
EGG AS FOOD! .. ..
JUTE AGRICULTURAL RESEARCH INSTITUTE FOUNDED ..
BUILD A PROFITABLE DAIRY HERD—M. L. Kohli & Radhey Mohan Sharma .. ..
IS INTERCROPPING POSSIBLE IN SUGARCANE CULTURE—ITS EFFECT ON CANE GROWTH AND YIELD—R. D. Rege & G. K. Patwardhan 2
DHURI COMMUNITY PROJECT ALLURING EXAMPLE OF SELF HELP 2
QUESTIONS AND ANSWERS 3

EDITORIAL BOARD

PRINTED AND PUBLISHED BY P. H. RAMAN AT THE ASS AND PRINTERS LTD., 505, ARTHUR ROAD, TARDEO, BO INDIAN COUNCIL OF AGRICULTURAL RESEARCH

ADVERTISEMENT RATES

CURRENT:
CASUAL

Full Page	Rs. 450/-
1/2 Page	Rs. 225/-
1/3 Page	Rs. 150/-

CONTRACT CONCESSIONS:

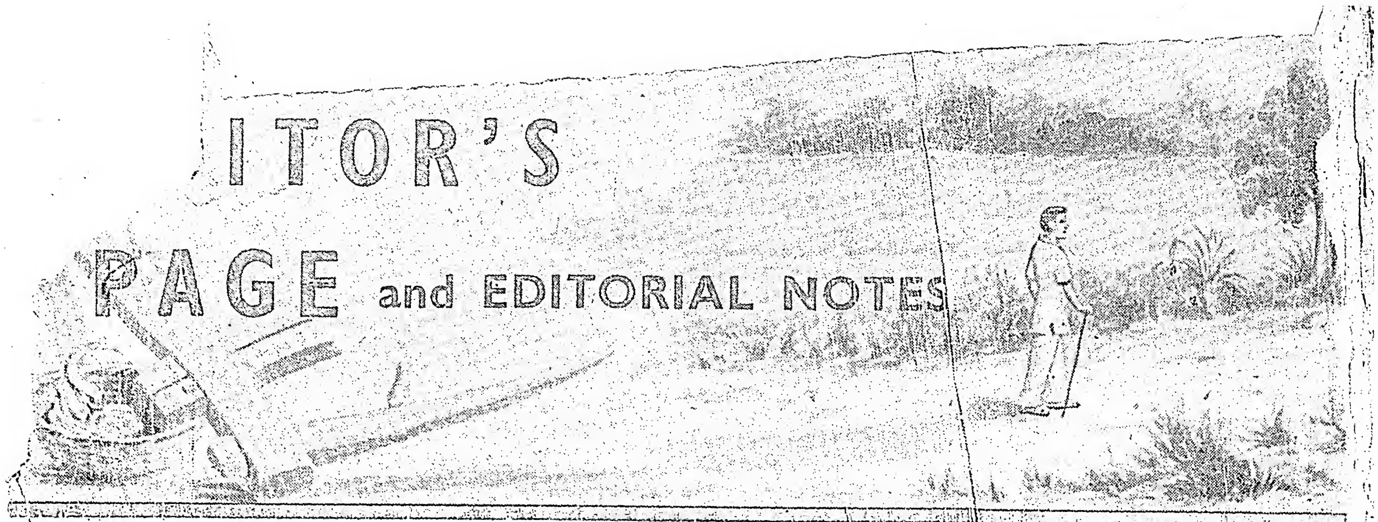
6 MONTHS	12 MONTHS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

Effective from October 1952 until further notice.

SUBSCR

Annas 12
Rs. 9-0-0
Rs. 4-8-0

All Busin
the "Age



At a recent conference of the Animal Husbandry Wing of th Board of Agriculture a
Animal Husbandry held at Poona comprehensive recommendatios for intensive cattle
provement were made. In drawing up these recommendations particular attention
given to breeding, feeding, disease control and the eradication of inderpest. In descril
the three fold problem so far as livestock in India is concerned, th Union Minister of A
culture, Dr. Punjabrao Deshmukh was not being poetic when he sail that the problem is
of meal, mating and malady or as diet, descent and disease.

The Conference focussed attention on the Key Village Scheme which constitutes the first
large scale attempt to solve the complicated problem of cattle development in India. It may
be stated for a better appreciation of the scheme that its magnitude and importance lies in
the fact that it embraces all aspects of cattle development, viz., breding, feeding, disease
l, management and marketing and, that it is carried out in vilages under conditions
ng therein. The primary object is to help the villagers to help hemselves by utilising
1 technique a d the latest results of research and information onthe problems of well
of cattle.

s the cattle can be fed better than they are
all efforts to improve breeding will obvi-
little avail and it was appropriate that
-was one of the important items on
s Conference. The provision of better
greater production of suitable fodder
arate but closely related aspects of
. The Indian Council of Agri-
s at present examining the question
utilisation of existing grazing
bility of converting land at present
seful pastures. It is evident that
d experimental work on the grasses
possibility of acclamatizing useful
ses are matters deserving early
not a pastoral country as judged
ndards of temperate climates.
nportance of the grazing lands
and an increase in their extent might do much t
raise the general standard of the working cattle in
the country. This matter has drawn increasing atten-
tion and Dr. R. O. Whyte, an F.A.O. expert workin
with the Indian Council of Agricultural Researc
has undertaken the preparation of a Handbook o
Grassland Management and Fodder Crops of Indi.
The work of surveying the grassland resources of th
country has also been contemplated with a view to
making recommendations for better grassland manage-
ment, introduction of new fodder crops and matters
relating to the stepping up of fodder production.

The veterinary problems of this country
intimately related to the vastness of India's ani
population. She holds a substantial portion of
domestic animals of the world. Contagious dise
of animals such as rinderpest, anthrax, surrah, e

took a heavy toll in the past with the consequence that operations intimately linked with cattle power in this country have suffered. On account of the diseases and consequent infirmities the cultivator is compelled to maintain a large stock of cattle. It is essential therefore to concentrate efforts on the control of animal diseases in order to improve the quality of our cattle. It is gratifying to note that considerable progress has been made in this direction by schemes financed by the Indian Council of Agricultural Research through the Central and State Research Institutions.

Economic marketing, protection of all animals against contagious diseases, provision of adequate staff for supervision, coordination and guidance and providing funds for the purchase of costly drugs where needed and more frequent cattle shows in regard to community projects—these were some of the other subjects which were discussed and the Conference urged that these should be treated as matters requiring urgent attention.

It is necessary that the common man should be taken into confidence in any project that the Animal Husbandry Departments undertake. This is an important factor and should not be ignored for the success of the project to a large extent depends on the cooperation of the common man. If this cooperation is ensured, the satisfactory working of such projects as, for example, the Key Village Scheme can hardly be doubted.

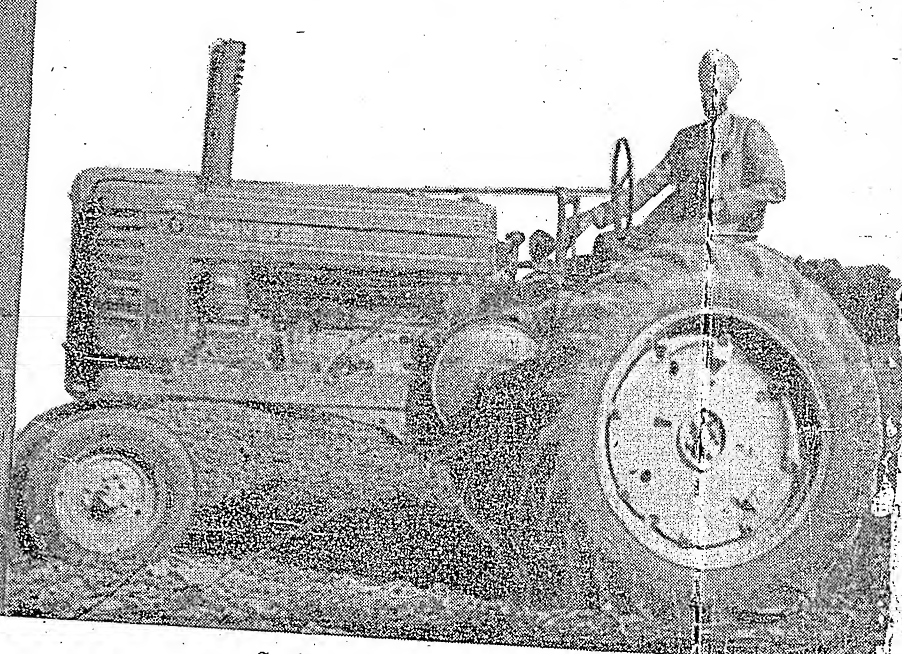
It is satisfactory to note that the work in connection with the popularisation of the Japanese method of rice cultivation has been making steady progress. Most of the States have evinced keen interest in this matter and have taken up the work in right earnest. The enthusiastic reception given to this programme is indicative of the cooperation that the cultivators are willing to offer in solving the food problem in this conutry provided they are convinced that the method recommended to them are likely to produce better yields. Since the Japanese method of rice cultivation comprises sound and sane agronomic practices, there has not been any difficulty in convincing the workers of its usefulness. The farmers' cooperation is willing and instinctive in any such programme of intensive cultivation; indeed their enthusiasm has been infectious. The literature pertaining to the Japanese method of rice cultivation produced by the Centre and distributed to the various States has been translated into most of the regional languages of the country. This has materially helped the campaign as the people in different parts could read and know about the method of their own languages and act according to the instructions given.

OUR COVER

Sturdy farmer helps grow more food: A smile of content and pride is a sure indication of his success

SURINDAR SINGH — PIONEE

Sardar Surindar Singh



S. Surindar Singh with one of his two—John

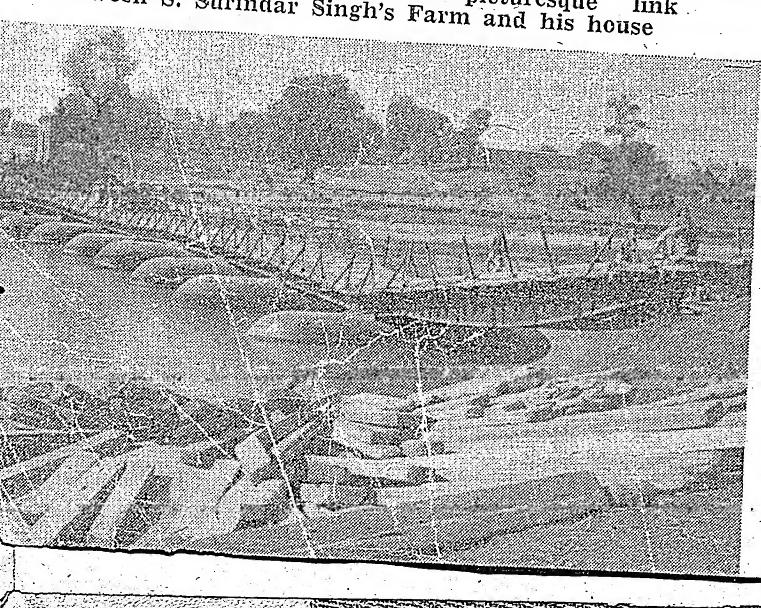
A PIECE of land reclaimed is a net addition to the country's agricultural resources. However, it requires sustained effort to do so. This is specially the case when one undertakes to develop a land which had been tried and abandoned for giving uneconomic returns. Only a Surindar could do it, for he is making a handsome living out of 300 acres that in the hands of his predecessors did not respond to any amount of money spent on them.

Sardar Surindar Singh belongs to Amadalpur, a village situated at a distance of about six miles from Jagadhri Town in the Punjab and is connected with it by the Western Jamuna Canal inspection road. A picturesque floating bridge constructed over this canal lends colour to his farmhouse.

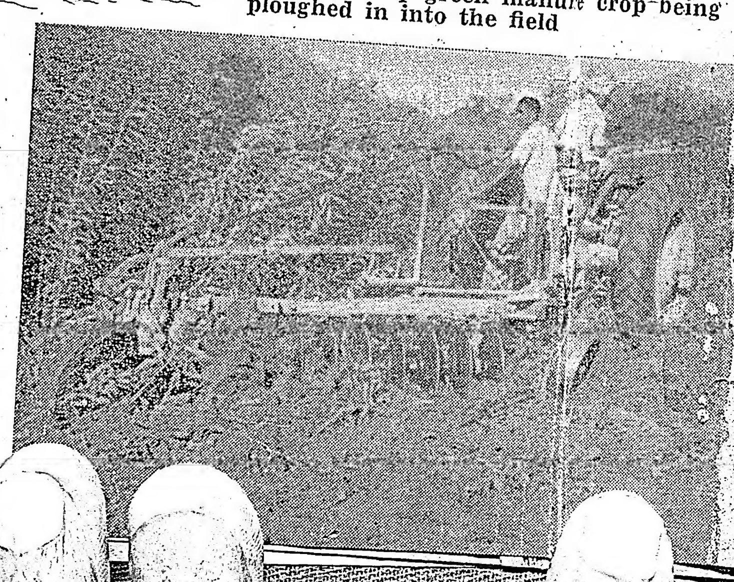
A PROGRESSIVE FARMER

I met this young farmer, hardly 25, last January. I saw his vast sugarcane field named after his father, Sardar Lal Singh. I noticed feverish activity going on there for transporting the bumper crop of sugarcane that had been raised this year to the nearest sugar

Amadalpur floating bridge—a picturesque link between S. Surindar Singh's Farm and his house



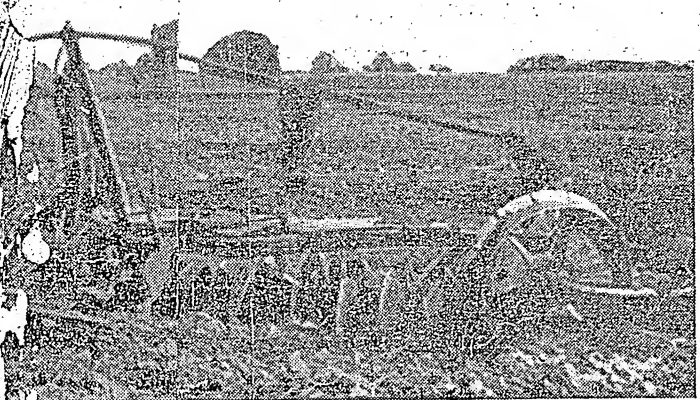
Seven feet high sann-hemp green manure crop being ploughed in into the field



MAN OF THE MONTH

[T]RACTOR FARMER OF AMADALPUR

By **HARKIRAT SINGH**



Deere traors with a cultivation attached to it

facty. The means of transport employed was a trailer attaed to a tractor. I was told that Sardar Surindar Sin was solely responsible for bringing these 'coughing angrowling' machines to that area where generally conrvative agricultural practices were followed. It way emulating the example of Sardar Surindar Singh tha the farmers in this area were slowly taking to meanical cultivation and there were; at present, as ma as five tractors in that small village.

Sardar Surindar Singh graduated in agriculture fro the Agricultural College, Lyallpur. Though young in years, he seems to possess intimate knowledge of the land and its problems and discusses them with confidence. He has also been abroad visiting England, France, Italy, Switzerland, Egypt, Cyprus and some Middle East countries for the purpose of getting first-hand knowledge of agricultural conditions obtaining therein. "I wanted to know," he said, "that given adequate means of cultivation and proper initiative, what maximum could we get from the land. I believe in seeing things for myself, getting practical information and not knowing things from a merely theoretical point of view." The trip to Europe gave him a chance to know the potentialities of intensive cultivation.

OPERATION RECLAMATION

It was many years ago, Sardar Surindar Singh told me, that his father, Sardar Lal Singh, lately the Director of Agriculture, Punjab and at present a Member of Parliament, bought this land attracted mainly by the low price at which it was offered. A luxuriant crop of various kinds of weeds stood over it. Moreover, the land was sub-divided into a large number of small pieces where mechanical cultivation was not possible. Quite an appreciable part being on the bank of a canal was swampy and required a great deal of attention to make it cultivable. It was decided that Sardar Surindar Singh should look after this land; and it cannot be denied now that he was the right choice.

When Sardar Surindar Singh took over this land from his father, it consisted of no less than 356 pieces ranging from 1/4th of an acre to 3 acres. It is only recently that it has been consolidated into four compact blocks of 190, 70, 15 and 12 acres. As many as 4,000-5,000 date-palms growing on this land were cut and their stubbles burnt. The land was then allowed to remain fallow for one rainy season. As the land became soft, the remaining deep-rooted stubbles were uprooted. *Kans* was destroyed by deep ploughing, *Pattera* by ploughing the field in waterlogged condition and *Baru* by cultivating the dry land several times in May and

Presenting arked contrast to the land growing bumper cro of sugarcane can be seen, in the fore-ground, a wampy patch representative of the condition some of the land before reclamation

One of the three tube-wells on the farm

Left—Co. 313 variety of sugarcane raised in an experimental plot. Standing in the midst of 15-16 ft. high canes is the untiring manager of the farm, Sardar Mangal Singh. Right—A load of cane being put on a tractor-drawn trailer for being transported to a nearby sugar factory.

June and then picking up roots with hands. The swampy low-lying patches were levelled up by putting earth into them. All this work was done with the help of tractors.

CROPS SOWN

The land being in *khadar* area, with plenty of moisture in the ground, the main crop planted is sugarcane. The main variety grown is L. 9, but trials with other varieties such as Co. 313, Co. 312, 453, Co. 29, etc. have also met with fair success. The cropping plan followed is as follows: 50 acres are put under sugarcane every year and a ratoon crop is obtained from 50 acres; another 50 acres are green-manured and prepared for next year's planting of cane; on the remaining area, oilseeds like *toria*, *sarson*, wheat, gram and maize of improved varieties are sown. The improved varieties of cotton like 231R Desi and 320F American have also been tried. The various crops are chosen according to the land conditions prevailing every season. The salient feature of the operation is that 1/3rd of the Farm every year is under a green manure crop, usually sann-hemp. Besides green manure, superphosphate, groundnut cake and ammonium sulphate are also used. On a reclaimed plot that is immediately adjoining the other side of the canal, Sardar Surindar Singh has raised a beautiful kitchen garden.

The land being moist does not require much of irrigation. The area has an average rainfall of 35 inches a year, too. Nevertheless, to guard against any serious drought that may occur in the months from April to June, the Farm has three tube-wells which are worked

(*Contd. on page 31*)


Safeguard your health from the germs in
EVERYDAY DIRT
with LIFEBUOY's
Protective Lather
Everyday, no matter how careful you are, you risk infection from the germs in dirt. Safeguard your health with the habit of bathing often with Lifebuoy Soap. Its protective lather washes away the germs in dirt and keeps you feeling fresh all day.
LIFEBUOY SOAP
LIFEBUOY SOAP
LIFEBUOY SOAP
LIFEBUOY SOAP
for everyday protection from everyday germs
L. 228-50

SEASONAL PESTS OF CROPS:

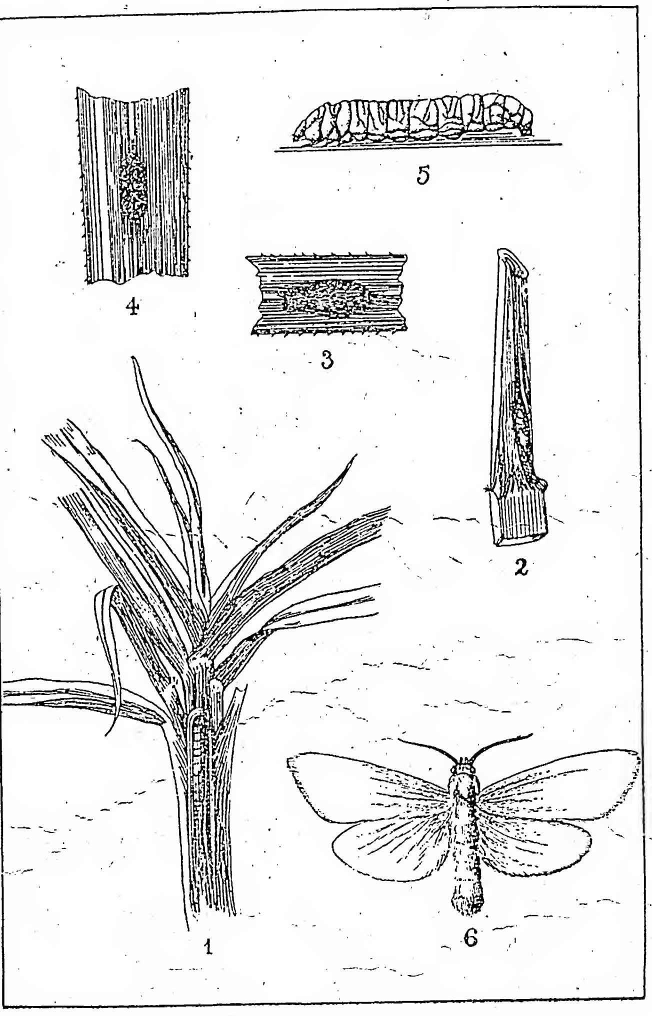
THE ROOT, STEM AND TOP BORERS OF SUGARCANE AND THE METHODS OF THEIR CONTROL

By

E. S. NARAYANAN

Indian Agricultural Research Institute, New Delhi

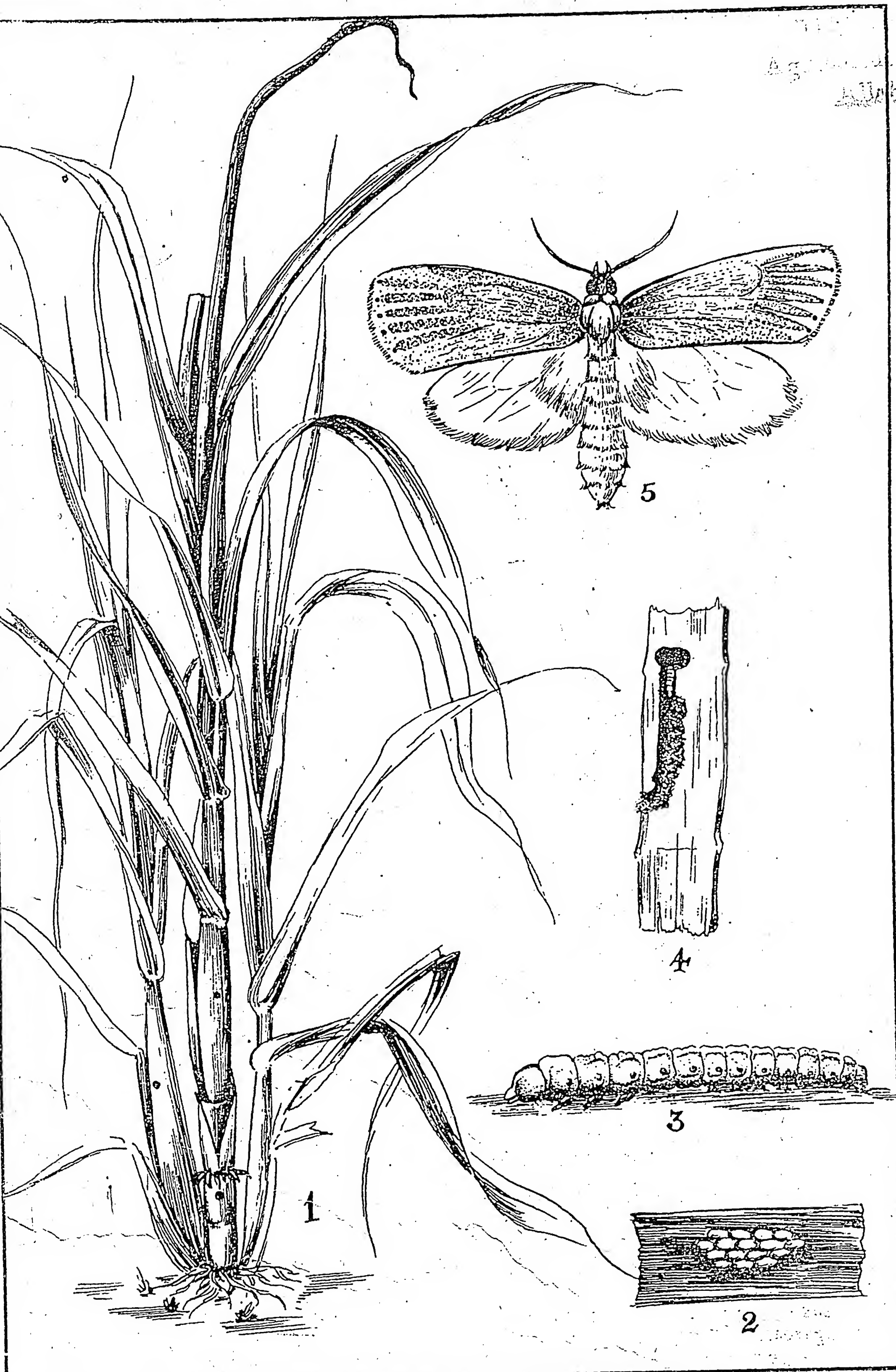
EVER since the Government of India granted protection to the sugarcane industry in 1932 for fostering and developing sugar industry in the Indian Union the acreage under sugarcane has gone on steadily increasing till today the area under sugarcane is over three million acres. This process of bringing large areas under sugarcane was facilitated by a variety of new canes bred in the sugarcane sub-station of the Indian Agricultural Research Institute at Coimbatore. One of the problems that has come to the forefront as a result of this increase in acreage is the problem of the insect pests of sugarcane. As is well known, insects multiply in geometrical progression and when their rate of increase is facilitated by the growing of a single crop in a continuous belt, the result that is produced is often times disastrous. A bountiful food supply grown in a continuous belt aggravates this problem of multiplication of insect pests to an alarming degree. As Munro has observed "the amount of food available to an insect is naturally a vital matter in relation to that insect's development and increase, and it is by increasing the food supply artificially that man himself creates the majority of his insect problems. The growing of crops in large but compact areas and the cultivation of pure crops of only one plant are wholly artificial pheonomena. They afford the insect an uninterrupted and large supply of its host plant, and thereby favour its increase." This is exactly what has taken place in the case of sugarcane borers in almost all the sugarcane growing areas in our country. In many factory farms canes are grown in large areas covering thousands of acres. They also grow ratoon canes. Thus there is not only a continuous belt of sugarcane but also sugarcane all the year round. In the villages also, the farmers, lured by the high price that sugarcane fetches in the market have begun a change-over from the food crop to the sugarcane which is essentially a cash crop. These practices have aggravated the problem of the insect pests of sugarcane which in certain areas have completely wiped out large areas of the cane crop.



SCIRPOPHAGA NIVELLA FABR. (TOP-SHOOT BORER OF SUGARCANE)

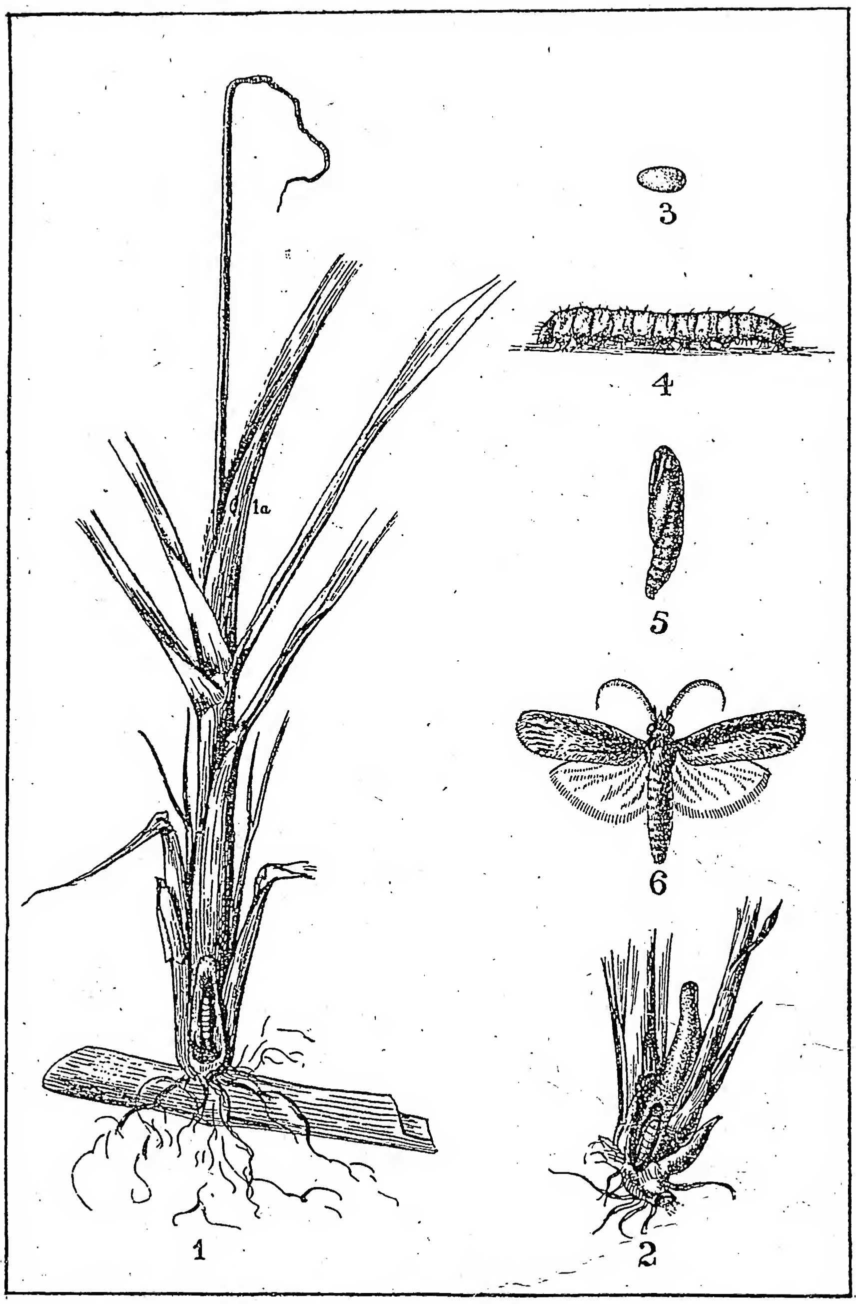
(1) A typical damage of the borer with the dead heart and the borer larva on the top most node of the plant. (2) A section showing the damage by the larva with the tunnel and the exit hole at the lower end. The larva has pupated and the moth is about to emerge. (3) An egg cluster on the leaf covered with hairs. (4) The egg cluster with the hairs removed. (5) The borer in larval form. (6) An adult moth (female)

Among the many insect pests of sugarcane that have been observed damaging cane in the sugarcane growing tracts of the Indian Union, the most destructive undoubtedly are the borers. The stem and top borers sometimes either individually or in combination have



ARGYRIA STICTICRASPIS HMPSU (STEM-BORER OF SUGARCANE)

(1) A typical damage of the borer showing the dead-heart. (2) An egg cluster on the leaf. (3) The borer in larval form. (4) A section showing the damage by the larva with the tunnel inside the cane and the larva about to pupate. (5) An adult moth (female)

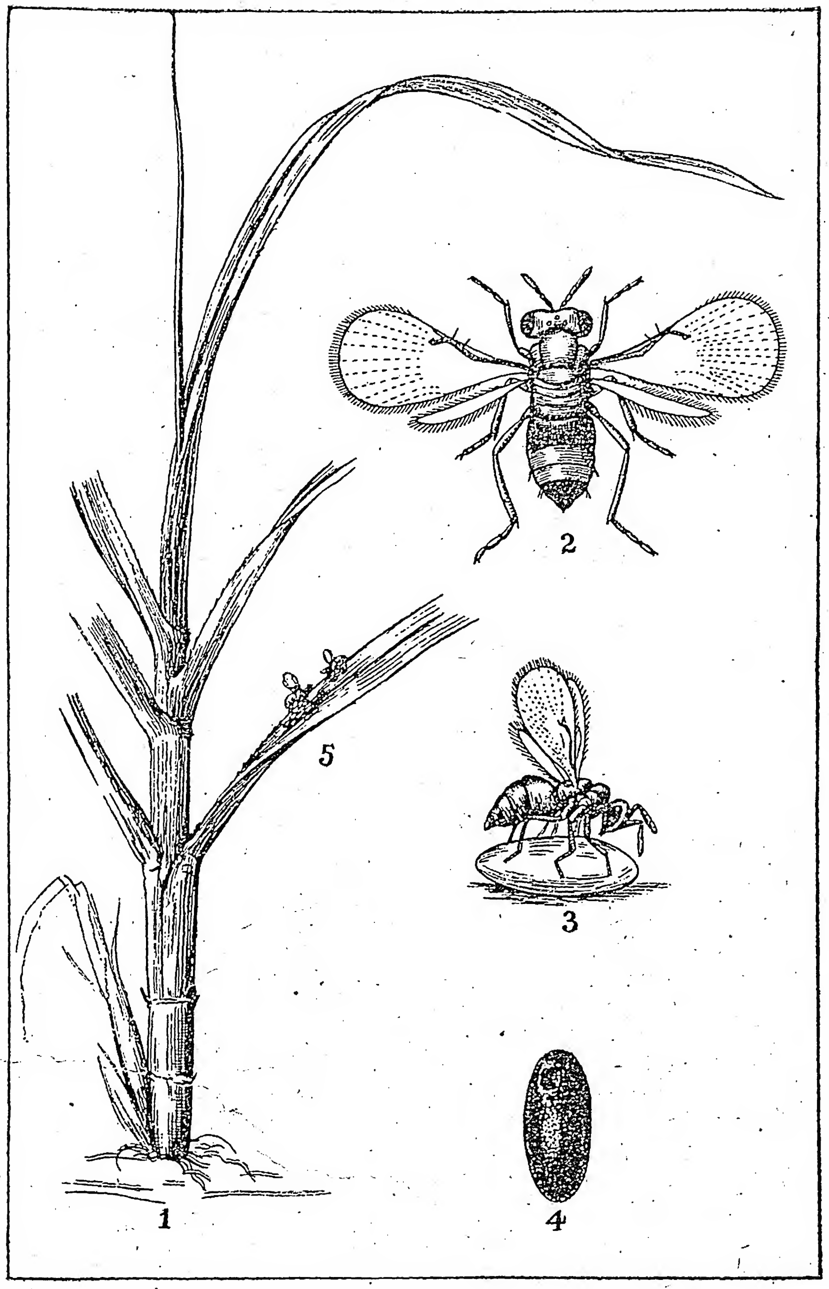


EMMALOCERA DEPRESSELLA SWINH (ROOT-BORN OF SUGARCANE)

(1) A typical damage of the borer with the dead heart and the borer larva in the tunnel near the base of the plant. (1a) An egg on the leaf. (2) An infested plant with the borer pupating near the base of the plant. (3) An egg. (4) The borer in larval form. (5) The Pupa. (6) An adult moth (female)

wiped out entire areas of sugarcane striking terror into the hearts of the sugarcane cultivators in our country. The author has seen large fields of sugarcane converted almost into dry stubbles by the stem borer, *Argyria tumidicostalis* in Setabganj, North Bengal. He has also seen the factory authorities at Walchandnagar, Deccan burning and ploughing up a large field infested by the top borer. The chief borers of sugarcane are the following :

The Root borer :	1. *Emmalocera depressella* Swinh.
The Stem borers :	2. *Argyria sticticraspis* Hmpsn.
	3. *Argyria tumidicostalis* Hmpsn.
	4. *Diatraea auricilia* Dudgn.
	5. *Diatræa venosata* Wlk.
	6. *Chilo trypetes* Bisset.
	7. *Sesamia inferens* Wlk.
The Top borer :	8. *Scirpophaga nivella* Fabr.



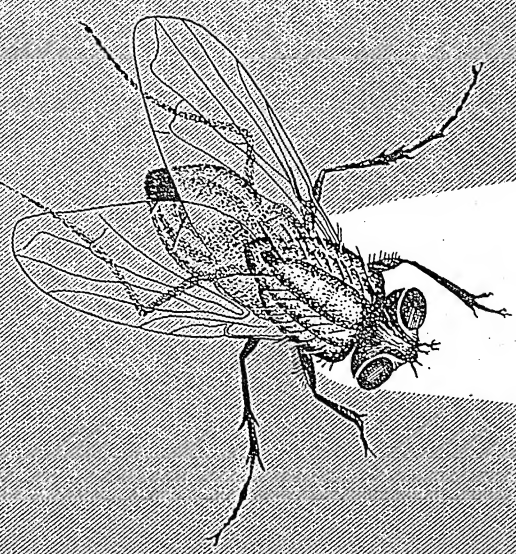
TRICHOGRAMMA EVANESCENS MINUTUM RILEY (AN EGG PARASITE OF SUGARCANE ROOT AND STEM-BORERS)

(1) A sugarcane plant showing some egg masses on the leaf. (2) An adult parasite female. (3) The parasite in the act of oviposition. (4) A parasitised egg showing the emergence hole of the parasite. (5) The parasite *Trichogramma evanescens minutum* Riley parasiting some stem-borer eggs on the leaf.

THE ROOT BORER
(EMMALOCERA DEPRESSELLA SWINH)

The root borer has been observed in the Punjab, Delhi, Uttar Pradesh, Bihar, Bengal, Orissa, Mysore and Bombay. It is possible that when a more intensive survey is made of the borer it may be found in other cane growing areas as well. The borer causes severe damage to canes only in the early stages when notes nodes have not been formed. We have indeed at present little evidence that the pest can cause any damage from the point of view of yield or recovery of sucrose when once the nodes have been formed. The damage is characterized by the appearance of a dried up central shoot greyish white in colour commonly known as the 'dead heart.' The moth which is of dirty brown colour lays eggs singly on the underside of the leaves. The egg is small flat and scale like in shape and creamy white in colour. The egg hatches out into a tiny larva that bores its way into the cane at the very base of the seedling producing the characteristic

(*Contd. on page 21*)



"Kill the fly!"

THE rainy season brings us one specially unwelcome pest, namely the common house-fly. A warm, moist climate is very favourable for the breeding of flies. As you may know, many insects are responsible for carrying and transmitting disease. The body-louse carries typhus fever, the mosquito is responsible for malaria, for the bone-breaking fever (dengue), for yellow fever and for elephantiasis. Rat flea is associated with the spread of bubonic-plague. Although the house-fly cannot be accused of direct responsibility for any one particular disease, it has been proved that this apparently harmless insect is probably more dangerous than any other insects in spreading many forms of infections indirectly.

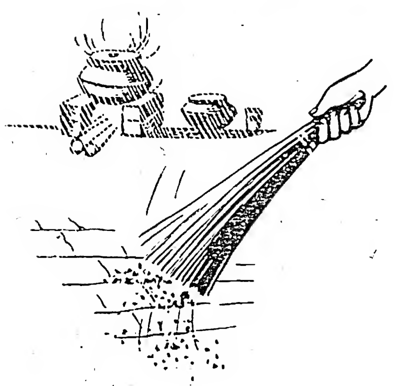
For example, the house-fly can transmit infection such as food poisoning, diarrhoea, dysentery, typhoid, cholera, intestinal worms, inflammation of the eyes, tuberculosis, possibly infantile paralysis and many other diseases and it is for this very reason that the house-fly should be treated as one of our most dangerous enemies.

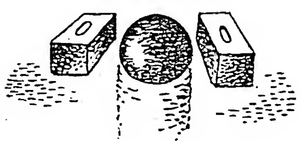
WHAT IS ITS LIFE HISTORY

The fly requires warmth and moisture during its breeding period and seeks these by breeding in garbage and refuse heaps in back-yards, in cesspools, latrines, urinals, drains and even in the kitchen if not kept clean. In all these places conditions are ideal for its nourishment and development as it feeds on human and animal excreta and decaying vegetables, fruit and food. Eggs are laid which grow into larvae. A larva feeds voraciously on the decaying organic matter till it becomes a pupa, a dark brown egg-shaped minute body. Having emerged from a pupa the young fly sets off in search of food at the nearest manure heap or collections of decaying animal or vegetable matter.

HOW THE HOUSE FLY INFECTS OUR FOOD

Another characteristic of this insect is that it cannot eat solids. When a fly alights on any solid food, it does one of two things. It either vomits the contents of its stomach or deposits its excreta, along with the various disease-giving germs, that it has absorbed from





refuse and manure dumps on to the food. It then uses its effect to rub this mixture of vomit and excreta into the food until it becomes liquid and then it sucks it up through its long tube-like mouth. One can realise that this is not a very pleasant picture.

An adult fly does not live for longer than 2 or 3 weeks but in that period what terrible mischief it can do! Not only can it carry disease producing germs in its body collected from its other feeding places and pass them on to human beings by vomitting on food, but it can also carry dangerous germs on its legs and body collected from manure heaps and refuse dumps. There are hairs all over the body and legs of the fly which cannot be seen by the naked eye, but which are visible under the magnifying glass and which harbour dirt and germs. Flies breed rapidly. A pair of flies if they both remain alive for 6 months can produce 55 crores of their kind.

HOW TO CONTROL FLIES

There is no substitute for cleanliness and it is the best way to stop fly-breeding in and around the house.

(1) All animal droppings and manure should be covered and converted into compost.

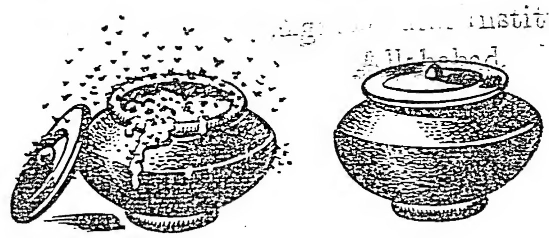
(2) Special refuse and garbage containers with lids should be provided for each house.

(3) Sanitary latrines should be constructed and wherever the pail and bucket system exists, the trap door of the dirt chamber should be fly proof and smeared from time to time with crude mineral oil to keep off the flies.

(4) Keep all food covered.

(5) Do not allow remnants of food collect in the crevices of flooring.

Remember that the fly is a creature of habits. It's breeding places are always dirt and refuse, while its fondness for sweets and sticky food is notorious.



Particularly in the breeding season the method of attack should be to concentrate on discovering the breeding places and getting rid of them.

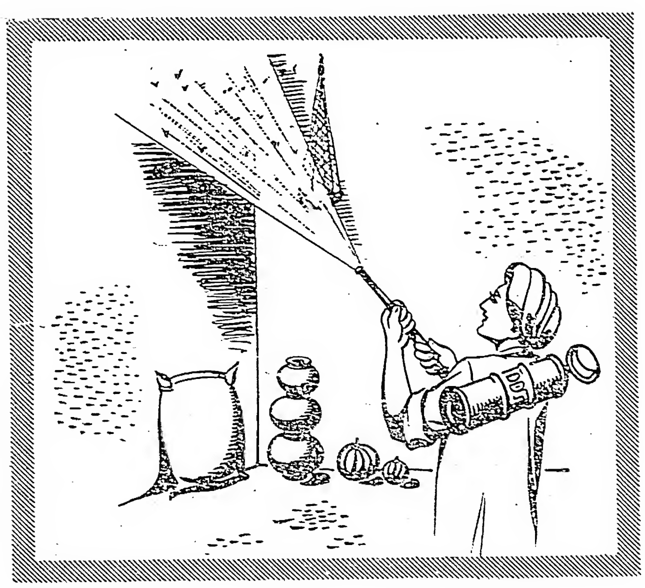
SPRAY D.D.T. OR GAMMEXANE

Where flies abound, a residual spray of D.D.T. or Gammexane on the walls, doors, roof and windows is very effective and the advantage of this method is that the effect lasts for a long time *i.e.*, 6 weeks to 3 months.

DON'T TAKE A FLY FOR GRANTED

A fly can be nuisance, buzzing around one's face when one is trying to take an afternoon nap, but that is nothing as compared to the harm it can do in spreading disease. So do not take the fly lightly. It is no respecter of persons or position and will take every opportunity to cause man and his family harm. Even if one's own premises are kept clean, the danger is not averted if the neighbourhood or streets are dirty. Flies can breed almost anywhere and can always make free gift of disease. "Kill the fly" should be the watch-word for all, particularly in the summer and monsoon when they are most abundant.

—Health Education Section,
Ministry of Health



HINTS ON THE CARE, MAINTENANCE AND AGRICULTURAL IMPLEMENTS AND

By **D. N. KHERDEKAR,**
Mechanical Engineer (Extension),
I. A. R. I., New Delhi M.P

Fig. 1

Suction of Mould board plough: The distance between the plough and the straight edge 'S' at 'M' & 'V' shows the suction

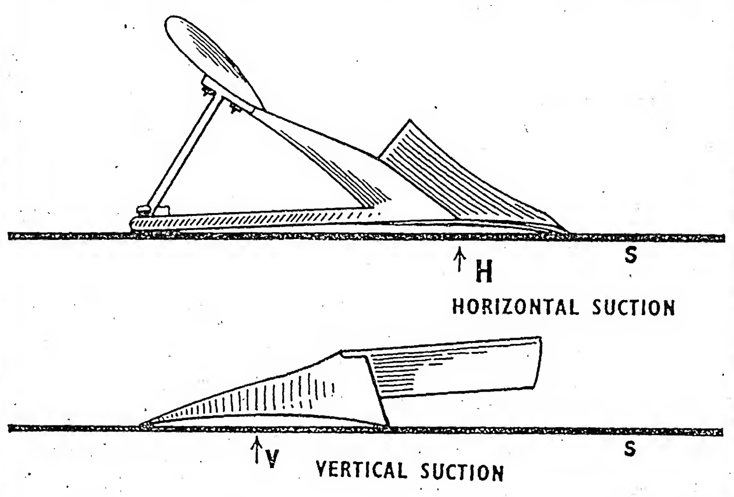
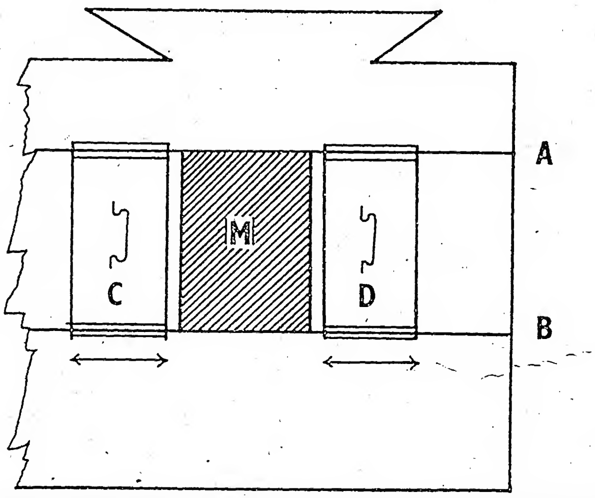


Fig. 2

Steel Winnower: To get the required draft the shutters 'C' and 'D' are moved sideways on lines 'A' & 'B' and the opening 'M' controlled



SLOWLY but surely Indian agriculture is going to be mechanized. Already some wealthy farmers are using tractors and tractor-drawn implements. Others are being persuaded to use improved bullock-drawn or manually operated implements. With the advent of the Community Projects and various Extension Schemes this process of mechanization will be greatly accelerated.

The implements and machines require care for maintenance. It is not just enough to purchase the implement; it must be properly maintained and efficiently used to get any profit out of it. The rules for care and maintenance of implements are very simple.

The more the complicated machines the greater the care they require. For the sake of convenience we may say that care is necessary for the following purposes :—

1. Care required in purchasing the implement
2. Care required in operation
3. Care required in storage
4. Care required in repairs

We shall now discuss each one of these points.

CARE REQUIRED IN PURCHASING

It is necessary that right at the time of purchasing we should take such precautions as to go in for only sturdy and strong implements and only those implements whose spare parts are readily available in the market. In the case of certain tractor-drawn implements there are some parts which are required to be changed after few months. Duplicates of these parts should be ordered right at the beginning so that the work is not held up for want of these parts.

CARE REQUIRED IN OPERATION

The first necessity in this respect is to strictly follow the manufacturer's instructions in setting up and adjusting the implement. Usually every manufacturer of machines supplies a book of instructions to his customer. These instruction books give hints regarding the adjustment, operation and sometimes even repairs. Even in case of small machines and implements the proper adjustment of parts should always be given great care. For instance, in the case of the mould board plough the *suction* of ploughs should be properly adjusted to get quick penetration and balanced working of the plough. Similarly, in the case of steel winnowers worked by hand the *draft* of the winnowing fan should be so adjusted as to make it suitable for particular grains like wheat, linseed, gram or *Til*. If this draft is not properly arranged and adjusted the winnowing will not be efficiently done.

Before using the implement we should always see that nuts, bolts, etc. are tightened and the bearings

REPAIR OF MACHINES

are cleaned and oiled. Similar precautions should be taken after the implement is brought back from work to the shed. Do not overload the implement or the machine. Take work from them only according to their capacities. After every day's work examine the implement for any breakdown of parts. Change any part, if required. 'A stitch in time saves nine.' This minimum care of changing the small parts will save further heavy expenditure.

STORAGE

In storage it is always better to have a shed with a hard floor and a water-proof roof, so that the implements are not damaged by rain, sun or white-ants. All wooden parts should be painted either with varnish or with ordinary coal-tar. The steel parts should be given a coating of oil after cleaning them properly. If the shed is not available, tarpaulin should be put over the implements to guard them against moisture and dust. Leather articles such as *mhots* or *chras* should be stored in such places where the rats do not get access to them.

If the farmer has quite a large number of implements it is better for him if he puts some identification marks on each and also keeps the record of all the implements purchased, disposed of, sold or given on hire. This record may be in the shape of log-book or an inventory whereby it is possible to calculate depreciation, interest on capital, etc. which gives the farmer exact idea as to how much his implement costs.

REPAIRS

In attending to simple repairs in the case of a breakdown it is essential that the modern Indian farmer should have a small kit-bag of tools which he can use as a sort of first-aid. Heavier repairs should be entrusted to an expert mechanic particularly in the case of tractors and other complicated machines.

Our farmers will have to learn to be a mechanic in a small way and also try to learn the use, construction and repairs of simple machine parts such as pulleys, gears, chains, clutches, levers, etc. These parts are commonly used on modern machines. The village craftsmen may be trained in using modern fitter's tools and even the technique of welding. Such a training will be to their financial advantage. In each of the big villages a sort of well-equipped nucleus workshop may be started. Eventually this will greatly help the introduction of improved machinery in Indian agriculture.

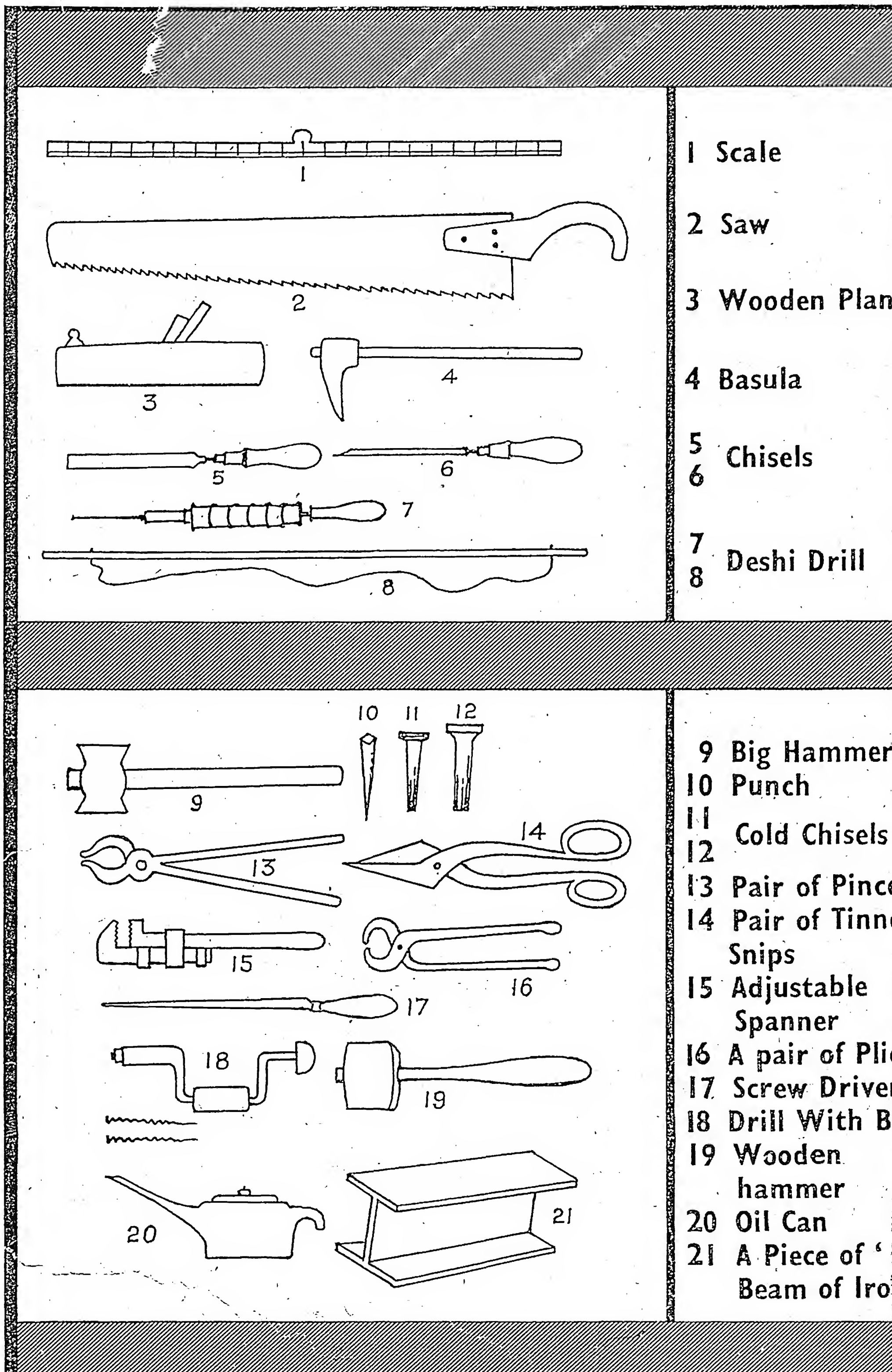
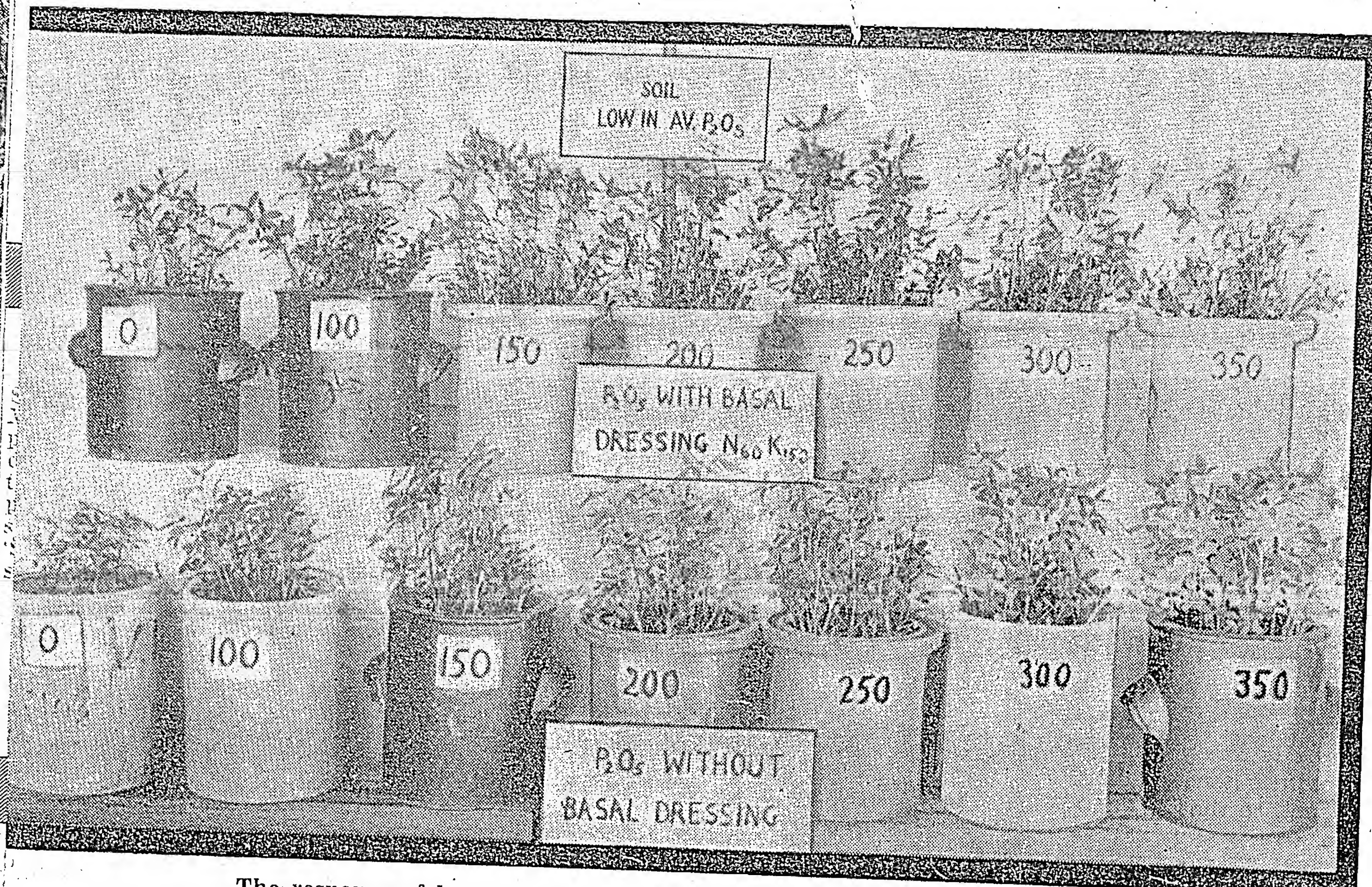
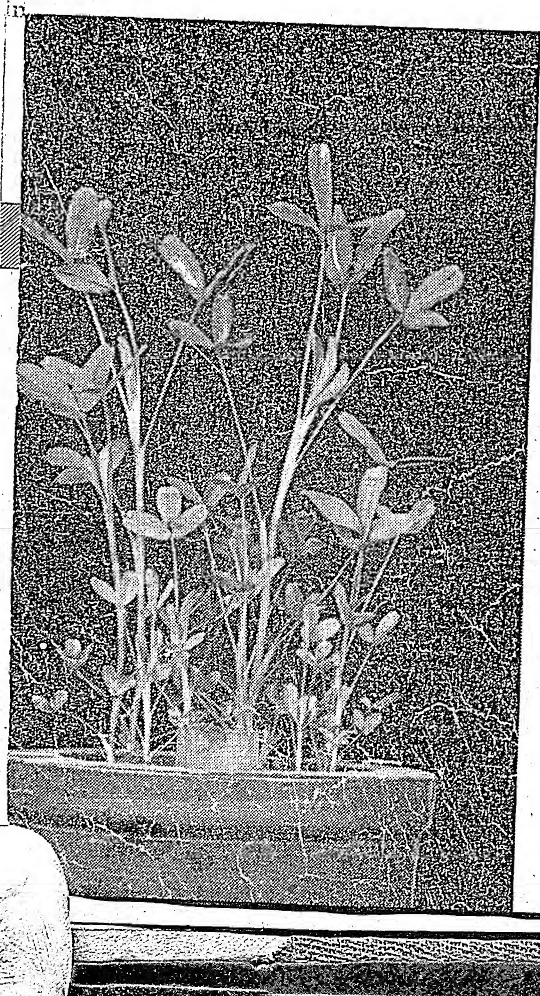


Fig. No. 3. Articles for kitbag



The response of berseem to applications of superphosphate

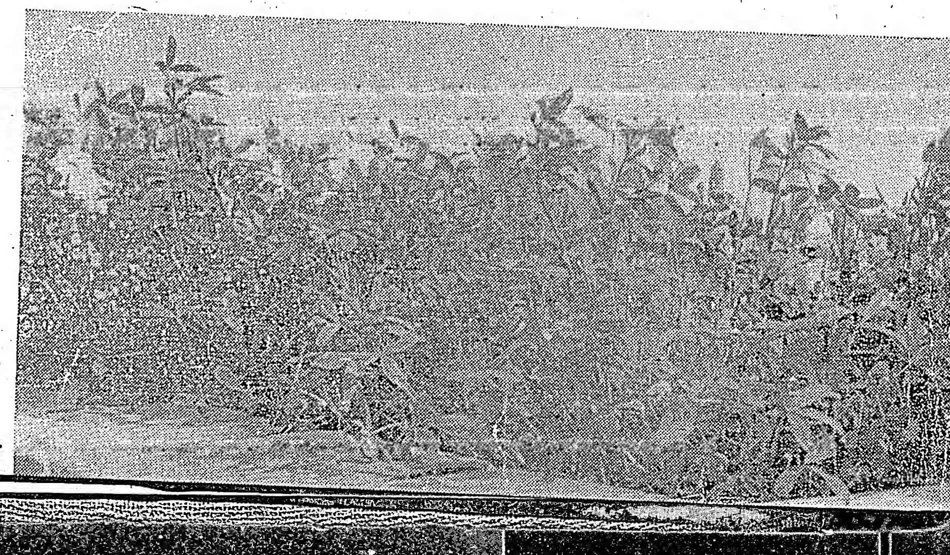
Berseem can grow even on ignited soil free from organic matter and nitrogen

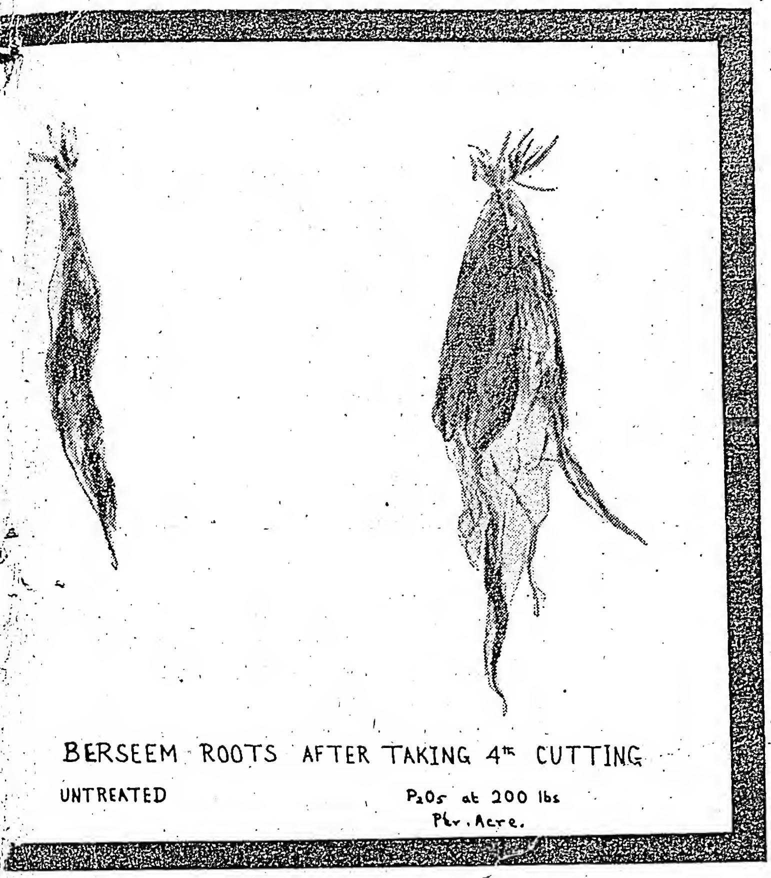


BERSEEM (*Trifolium alexandrium*), sometimes called the Egyptian Clover, played an important role in improving the fertility of the Egyptian soils and was imported into India in the beginning of this century. Since then, it has spread rapidly over big areas of the East Punjab, Uttar Pradesh and Bihar. Experiments carried out at the Indian Agricultural Research Institute, New Delhi, during the last 10 years, have shown that the growing of berseem as a fodder crop in rotation with other crops, has proved beneficial by increasing the yields of the succeeding crops and by building up the fertility level of the soil, in terms of improved physical condition, higher organic matter level and greater micro-biological activity. Attempts should, therefore, be made, wherever possible, to introduce berseem in the crop rotation.

Berseem is a *rabi* legume, which is sown in October or early in November and occupies the ground till about May. The seed-rate is 25-30 lb. per acre, depending on the

Berseem grown with application of superphosphate





Phosphate application increases nodule formation and size of berseem roots

GROW BERSEEM AND ENRICH THE SOIL

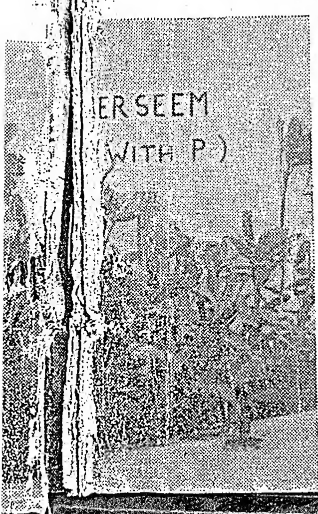
By
C. N. ACHARYA,
Indian Agricultural Research Institute,
New Delhi

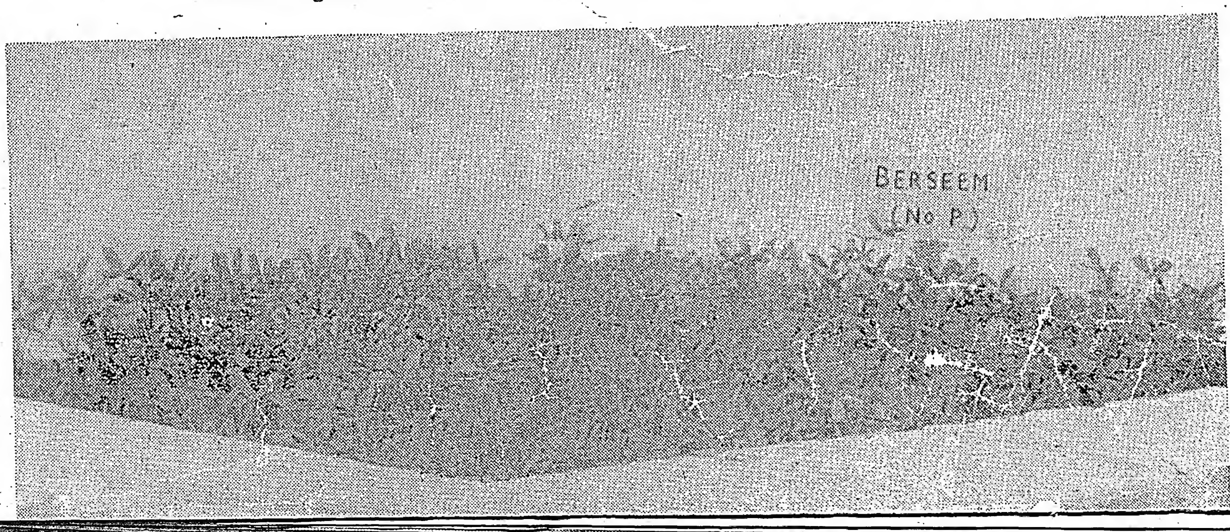
fertility level of the soil. The crop requires about 10 to 12 irrigations, the first one soon after sowing and the others at intervals of 2 or 3 weeks. The growth of the crop is slow during the first two months, but can be hastened to some extent by applying a top-dressing of ammonium phosphate, say about 50 lb. per acre. At the end of six weeks, a cutting is given, after which the growth becomes more rapid. Further cuttings are given periodically once in 3 or 4 weeks, depending on the rate of growth. If it is not desired to leave the crop for seed, about 5 or 6 cuttings may be taken between December and May. The fodder produced is highly nutritious and is liked by cattle; and contains about 3 to 4 per cent nitrogen (about 20 to 25 per cent protein) on the dry matter (moisture about 85 per cent) and fetches a good price in the market.

Berseem grows well on soils rich in lime, phosphoric acid and potash. Indian soils contain, in general, adequate amounts of potash, but in some cases the quantity of available phosphoric acid is rather low. In such cases, it is found that berseem responds markedly to additions of superphosphate at the rate of four to five maunds per acre. By the application of sufficient nutrients, yields as high as 1000 maunds per acre may be obtained in five or six cuttings.

Berseem is a legume crop and fixes considerable amounts of nitrogen from the air, up to a level of 150 to 200 lb. nitrogen per acre. While the main bulk of the nitrogen so fixed from the air is utilized for the growth of the above-ground shoots,

Berseem grown on Delhi soil without application of phosphate





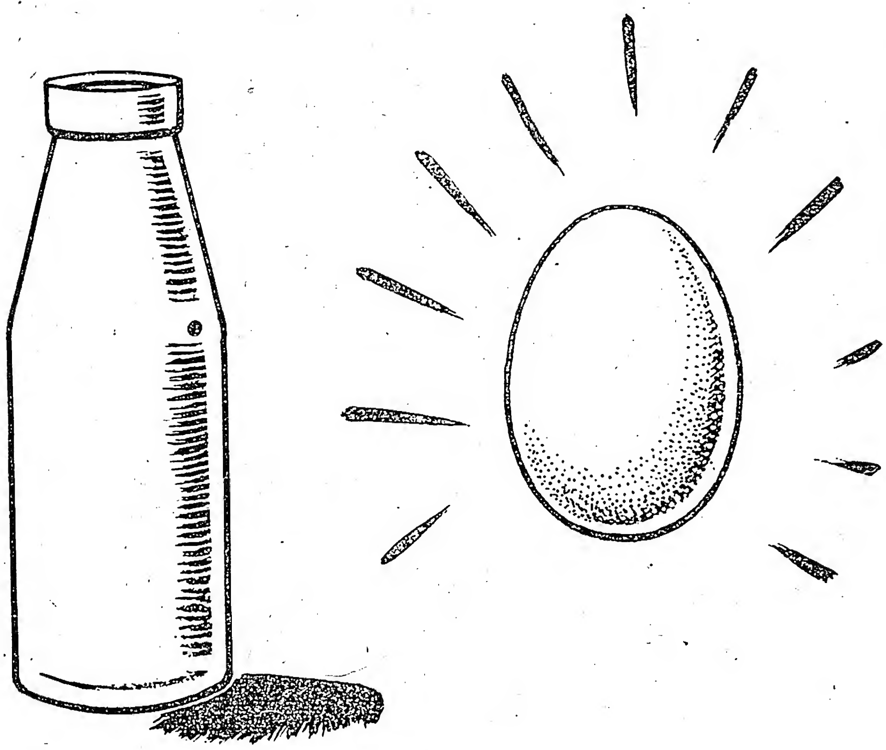
still a substantial portion of the nitrogen accumulates in the soil and helps to improve the fertility level of the soil from year to year. The amount of nitrogen so fixed from the air can be increased markedly by additions of phosphate, lime and potash in areas where these are deficient and also by adding a small dose of, say one pound of sodium or ammonium molybdate per acre, dissolved in a bucketful of water and sprayed in portions all over the field.

The fixation of nitrogen from the air by berseem is brought about by the action of a special species of bacteria, known as the Rhizobia or the legume bacteria, living on the roots of the crop and forming small nodules (concretions) thereon. The bacteria act in cooperation or symbiosis with the plant, i. e. in a manner which is beneficial to the plant as as well as to the bacteria themselves. The plant prepares carbohydrates food-material in its leaves with the help of sunlight (photosynthesis) and sends the food material down to the bacteria on the roots for their nourishment. In return, the bacteria exert their special powers of fixing nitrogen from the air and supply it to the plant in a form suitable for its nourishment.

Legume bacteria are of different kinds (groups and strains) which vary considerably in their capacity to fix nitrogen from the air as well as in their capacity to form nodules on the roots of different plants. Thus, the legume bacteria which form nodules on berseem roots may not attack the roots of other legumes like sann-hemp or *dhaincha*. In the absence of the proper kind of legume bacteria, the growth of the concerned legume crop, e.g. berseem, sann-hemp or *dhaincha* is likely to be poor due to nitrogen starvation.

It is, therefore, necessary, in order to obtain high yields of berseem, that the soil should contain the proper legume bacteria which could form nodules on its roots and fix nitrogen from the air. In many areas, where berseem has been introduced recently, the necessary bacteria may be absent or only a poor strain of it may be present. In such areas, it would be found highly profitable to coat the berseem seeds, before sowing, with solutions or pastes containing the active berseem legume bacteria. The Indian Agricultural Research Institute, New Delhi, has carried out considerable research work in this direction and possess stocks of active cultures of different kinds of legume bacteria to suit different legume crops. Necessary supplies and full details regarding the method of coating the seed with the bacteria can be had on application to the Institute. It may be mentioned in this connection that the bacteria are completely harmless to man and incapable of causing disease to human beings. They can safely be handled. The active bacteria, when once added to a field, manage to live there for a year or two after the crop is removed, but they slowly get weaker in their powers of fixing nitrogen from the air, and hence it is always a paying proposition to pre-treat the seed with legume bacterial cultures every time the crop is grown. The soil, of course, should be tested from time to time in order to make sure that enough supplies of calcium, phosphate and potash as well as trace elements like boron and molybdenum are present therein, so as to produce the maximum crop yields possible.

Egg As Food!



THE egg is misunderstood. Most people think that a chicken egg is an unborn chicken. This is not true. Instead the egg as we know it, is food for the un-hatched chicken. This food has about the same composition as milk.

It serves the same purpose to the chicken as milk does to the calf. The egg is the only food the baby chick ever gets directly from its mother, while the calf depends on its mother long after it is born, and any milk we drink from the the cow is depriving a young cow of its food.

While the cow will not give milk unless it has a calf, the hen is a different creature.

Hens without males will lay as many eggs as hens with males. The infertile eggs from hens without males are the same as the fertile eggs except for one small point. Within the fertile egg there is life. Within the infertile egg there is no life. There is only food. Food for the baby chick if he is there—food for you if he is not. It is clear that there is no violence attached to cracking the shell of an egg containing no life. It is up to our producers, therefore, to produce this kind of egg.

The food from the eggs, as pointed above, has the same food values as milk. It has advantages over milk, however. Eating infertile eggs deprives no young life of food. The egg is in a sealed sanitary package, safe from dust or adulteration. Eggs can be produced without heavy investment.

Keeping hens can be economical. Feed for a few hens can come from the scraps of the table. Sales of old birds can pay for their feed—the egg will be profit.

Shri R. A. Kidwai laying the Foundation Stone of the Jute Agricultural Research Institute, Barrackpore

JUTE AGRICULTURAL RESEARCH INSTITUTE FOUNDED

SHRI R. A. KIDWAI, the Union Minister for Food and Agriculture, laid the foundation stone of the Jute Agricultural Research Institute at Barrackpore on 9 February, 1953.

In his introductory address, Shri K. R. Damle, President, Indian Central Jute Committee traced the working of the Committee and the Institute which was originally established at Dacca in 1938. With the partition of the country 4/5th of the total area under jute went over to Pakistan, while all the jute mills were situated in India. To solve the problem of providing raw jute to keep the mills going, the nucleus of an Institute was set up in 1948 in a rented house at Hooghly with a 50-acre farm at Chinsurah. This makeshift arrangement however, came to an end when 104 acres of land were presented by the West Bengal Government to the Committee for establishing the Institute on a permanent footing.

Important results of practical value obtained at the Institute include evolution of improved jute strains and the development of a labour saving jute seed drill. Encouraging results have also been obtained in row

Shri K. R. Damle, President, Indian Central Jute Committee, reading out the address

cropping and double cropping and jute manuring experiments conducted at the Institute. Research has also been conducted on physiological and anatomical studies, control of diseases and pests, seed storage and retting of jute fibre.

Estimated to cost Rupees seven lakhs initially with a further Rupees ten lakhs for a second floor, the Institute is expected to be completed within the next six months.

THE ROOT, STEM, AND TOP BORERS OF SUGARCANE AND THE METHODS OF THEIR CONTROL

(Contd. from page 11)

'dead heart'. When the nodes have been formed, the larva enters the root stock and lodges itself into a small tunnel that it has furrowed for itself and no external symptom is visible. The larva lies at one end of the tunnel the rest of the tunnel being covered with woody frass. The full grown caterpillar is about 25 mm. long and pale white in colour. At the time of pupation the larva moves up towards the shoot almost to the level of the soil to facilitate the emergence of the adult.

CONTROL MEASURES

(1) Ratooning of canes, as an agricultural practice in the sugarcane growing areas should as far as possible be discouraged.

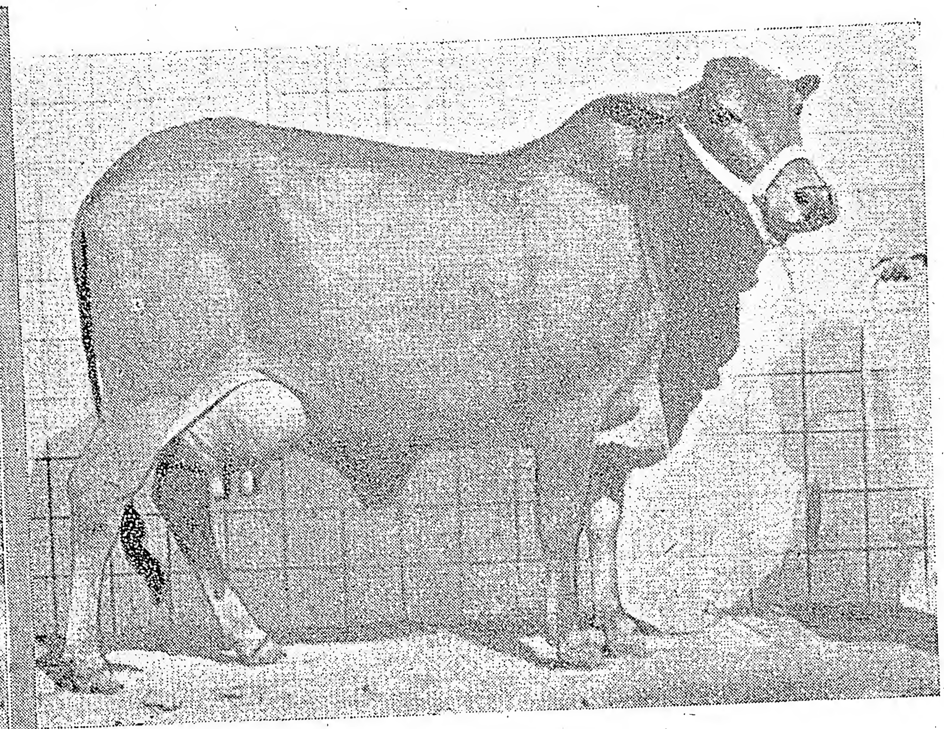
(2) In those areas where the canes are harvested by cutting them at ground level, the stubbles left in the field after harvest should be dug out and destroyed, as these harbour root borer larvæ and pupæ. It is however recommended that the canes are harvested by digging them out as this practice has been found to increase the yield of cane.

(3) The egg parasite *Trichogramma evanescens* minutum Riley may be released when the infestation is severe.

THE STEM BORERS

Though seven stem borers have been recorded from the various sugarcane growing areas in India, only one species *Argyria sticticraspis* is common to all the regions. The other borers occur as a major pest only in certain well defined tracts of the Indian Union where cane is grown. *Argyria tumidicostalis* has been recorded in east and north Bengal and also reported from Purnea in Bihar and Jorhat in Assam. *Chilo trypetes* has been observed as a major pest only from Gurdaspur, Jullundur and Dehra Dun. *Sesamia inferens* is sometimes a serious

(Contd. on page 29)



A good dairy cow

BUILD A PROFITABLE DAIRY HERD

By **M. L. KOHLI** and **RADHEY MOHAN SHARMA**

HEALTHY and high-yielding cattle are an essential pre-requisite of successful dairy farming. An enterprising dairyman has either to purchase good dairy cattle or to raise a herd of his own. Due to scarcity of really good milch animals and high prices of such stock, the latter course is more practicable. For this the best way is to effect improvement in the existing stock by a process of selective breeding.

SELECTION OF A COW

The value of a dairy cow is determined by (1) her capacity to produce milk, (2) her capacity to breed regularly and pass her good qualities on to her offspring; and (3) the length of her useful life.

A good dairy cow possesses attractive general appearance revealing vigour, well balanced carriage with a graceful gait. She should have a comparatively small head and a well formed body, with wedge-shaped appearance, the greatest width being between the hips and the apex of the wedge at the point of withers. The udder should be well developed and capacious, extending well forward with the rear attachment high and wide. The quarters of the udder should be evenly balanced, symmetrical and free from lumps or hardened tissue. A good udder shrinks after milking. Teats should be uniform, of convenient length and size, well apart and squarely placed. The udder veins should be long, tortuous, prominent and branching. The skin should be of medium thickness, loose, pliable and with fine hair. There should be no excessive fat on her body. The animal should be docile.

Selection of young heifers is somewhat difficult. It should be based on her dairy conformation and records of production of her ancestors and other related individuals. Animals related to poor milk performers should be discarded.

CULLING UNPROFITABLE COWS

Culling plays an important part in profitable dairying. An intelligent dairy man knows, that though the gross production of the herd would be reduced, the cost of milk production is automatically reduced with increase in profits, by discarding low-producing cows. A practical breeder often finds difficulty in distinguishing a good cow from a poor one, as opinion formed on the basis of general appearance alone is not always dependable. This, therefore, necessitates the maintenance of proper records of milk production, feed consumption, dates of mating and heating, etc. These records will reveal the efficiency or otherwise of the individual cow in a herd and the dairyman can take steps to replace the poor cows with better ones and gradually build up a herd of high producers at minimum expense. The average yield of the ~~herd can thus be increased year-by-~~year by persistent culling of unprofitable cows and retaining heifers from better ones.

AGE FOR BREEDING

The age for breeding depends on breed, general growth and development of the heifer. Since it will not yield any income until calving, it should be fed liberally in order that it may mature early. The breeding of heifers that have not made good growth should be delayed somewhat, since early breeding and consequent strain of lactation may result in stunted growth. Dairy heifers from one year onwards should be fed 2-4 lb. of grain mixture (equal parts of

crushed grams, oilcake and wheat bran) per head daily, in addition to abundant supply of good fodder. If fodder is only of a fair quality, the grain mixture per head may further be increased by 1 to 2 lb. daily to promote normal growth.

Heifers which calve early must be fed liberally during their first lactation so that their growth may not be hindered.

FREQUENCY OF CALVING

Usually it is preferable to have the cows calve at intervals of about 12 months, as this has been found to benefically affect milk production. A much shorter interval than a year is likely to reduce the yield of milk, and shorten its period of usefulness.

Service soon after calving results in a low conception rate. It is advisable, therefore, to avoid mating during two heat periods following parturition to help the reproductive system regain its normal efficiency.

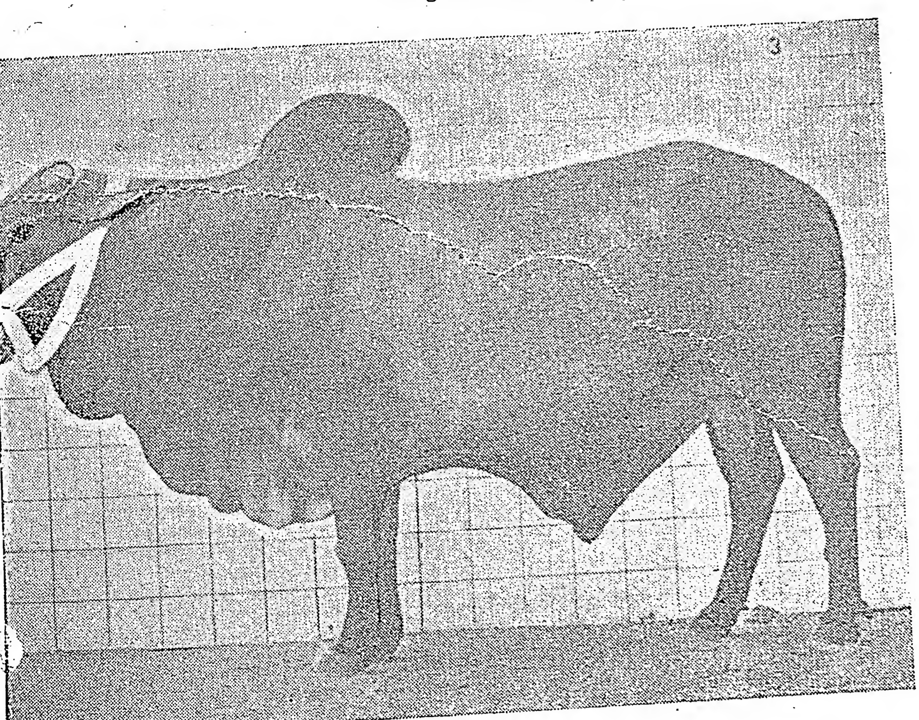
SEASON FOR CALVING

No specific suggestions can be made for fixing the season of calving in view of the fact that climate in our country varies from place to place. It may generally be said that the season, when there is abundance of pasture, is quite favourable for calving. Milk yield of dairy cows during extreme weathers is reduced to an appreciable extent and the growth of animals is also adversely affected. Cows that calve during the favourable season yield more milk than those which calve during the severe summer season. Controlled breeding is thus essential for making the dairy a profitable concern. To achieve this maintenance of proper breeding records is desirable.

CURTAILING DRY PERIOD

For successful dairying, the problem of regular breeding of the herd is very important. Dairy cattle which fail to conceive within 3-4 months of their last calving are a liability to the owner. It is, therefore, essential that every dairy cow should calve regularly each year to make the concern a paying one. But a large number of heifers in India are often slow to mature for their first calving and the cows in general have a long dry inter-calving period. The factors involved in securing optimum fertility results for building up a profitable breeding herd, depend upon the age of the animal, its physical condition, plan of nutrition, heredity and management of livestock. Recent discoveries have shown that certain

A good dairy bull



proprietary preparations such as Pregnant Mare Serum, Stilboestrol, etc. give encouraging results to induce heat earlier in late maturing heifers and to shorten the dry period of cows which do not come in heat for long periods after calving. The measures indicated above, if judiciously employed, will go a long way in stepping up the production of milk in this country.

FEEDING FOR PROFITABLE PRODUCTION

No herd will produce plenty of milk and good butter-fat unless each cow is fed properly. Many cows which could be profitable producers are not given as much feed as they require to produce maximum quantity of milk and butter to the best advantage of the dairyman. But a cow may also be unprofitable if she is given more feed than what she can utilize for milk production. Maintenance of proper production records would enable a dairyman to determine true requirements of ration for each cow.

Computing rations for dairy animals has to be considered on the basis of maintenance and actual production. One seer of grain mixture is sufficient as a maintenance ration while for milk production an extra amount at the rate of ½ seer for every one seer of milk yield is considered adequate. But the ration should always be adjusted to the capacity of the animal to assimilate. A pregnant cow should be given an an additional quantity of half a seer of grain to bear the extra strain of nourishing unborn calf. In addition, an ounce of common salt per day should also be given to each animal. A liberal supply of clean water is essential for proper secretion of milk. Water should be given three times a day and more frequently during the summer season.

BREED TO A GOOD BULL

Regardless of how well a herd is fed and cared for, it cannot produce more than its inherited capacity. Thus, after careful culling and proper feeding of the stock, the dairyman should concentrate his efforts to improve the inherent producing capacity of his herd by breeding his cows to a good bull. A bull is considered to be 'half the herd' as it produces many young calves in a year while a cow hardly produces one. Hence the choice of a bull makes or mars a herd.

The sire contributes half to the inheritance of each of his daughters while the other half is from the dam. By the continued use of carefully selected pure bred bulls on even non-descript poor yielders, it is possible within a few generations to have a herd which will closely resemble in appearance, action and practical value to the pure-bred.

SELECTION OF A BULL

The bull should be the best of its kind and should be able to produce high milk yielding heifers of good size, normal health, impressive appearance, fertile and free from diseases. The selection of such an animal rests on the following considerations :

Appearance : The appearance of the animal to a great extent indicates what the animal seems to be. He should have an attractive individuality revealing vigour, masculinity, an impressive style and graceful carriage with an active and well-balanced gait. He should have the desired breed characteristics. The body should be free from excessive fat and the animal should have good digesting capacity. The skin should be thin and loose with fine hair.

PEDIGREE

The pedigree is a graphic representation of the ancestry of the animal. It indicates what the animal ought to be. A good pedigree chart should not only have names of the animal's immediate ancestors and close relations but should also have their complete and actual records of milk yield and butterfat. Selecting a bull on the basis of his dam's records alone does not help much in evaluating the prospective sire. It is essential to have a complete pedigree for the last three generations to judge what an animal would be. Pedigree if judiciously used can be an effective instrument for the proper selection of the animal.

PROGENY

This shows what the animal actually is. Evaluating animals on the basis of progeny performance is the most reliable method that is available to the breeders of dairy cattle. This method constitutes a comparative study of milk performance and butter-fat yield of daughters in relation to their dams. A good bull should have daughters

which could excel their respective dams both in milk production and butter-fat yield. For estimating fecundity or the transmitting ability of a sire, the records of at least six of his daughters, selected at random from the herd, should be compared.

MAKE BEST USE OF A SELECTED BULL

Unfortunately the supply of good bulls, which is chiefly from government livestock farms is limited and the services of pedigree bulls available are confined to a small number of cattle. This has hindered the progress of cattle breeding. The services of useful bulls can be widely extended by making use of the technique of artificial insemination. This will help to a greater extent in overcoming the existing shortage of breeding bulls. Most of the progressive countries of the world today are making the best use of this method in improving their livestock. It has also been successfully used in this country to a limited extent. A farmer can safely take advantage of this method to produce superior calves by breeding his cows to outstanding bulls.

MAINTAINING HERD HEALTH

Contagious diseases of livestock may destroy all anticipated profits if proper steps are not taken to maintain the health of the herd. It is necessary, therefore, that the herd should be properly and timely immunized against the common contagious diseases such as rinderpest, haemorrhagic septicaemia, black quarter, etc. Newly purchased animals should not be allowed to mix up with the healthy herd for at least 14 days to avoid introduction of any infectious disease.

It is a sound plan to turn out cows for exercise daily, particularly when weather is suitable. Too much exercise should be avoided in the case of cows in advanced stages of pregnancy for fear of abortion.

IMPORTANT NOTICE

Dear Subscriber,

Perhaps your subscription has expired by now and you must have forgotten to renew it.

It helps us greatly if you can advise renewal of subscription. In the absence of specific instructions you continue to be a subscriber and will be receiving your copy.

Certain subscribers have, in spite of repeated reminders, not remitted their arrears of subscription for the last year. Will they kindly look up and remit the arrears as well as the renewal subscription.

You can just fill in the form and mail it to us with your remittance. Please quote your subscription No. in all correspondence.

The Business Manager,
Indian Farming,
505, Arthur Road, Tardeo,
Bombay 7.

Quote your Subs. No.

Sir,

I am remitting by M.O./P.O./Cheque a sum of Rupees Nine/Eighteen towards my renewal/and or arrears for the period .... of subscription for the Indian Farming.

Signature.

Name..
Address...
....

In case of upcountry Cheques, kindly include annas eight towards bank charges.

IS INTERCROPPING POSSIBLE ... ITS EFFECT ON CANE ...

By **R. D. REGE** and G. K.

AMONG the different practices of crop growing, intercropping, *i.e.* taking a quick growing subsidiary crop in the main crop is a common one when the main crop is of long duration. Sugarcane, which takes from six to eight weeks to germinate and start its developmental activities, has been considered a very good main crop for intercropping with *Bhendi*, cucurbits, etc. Under the present situation of food shortage, however, intercropping sugarcane with a suitable cereal crop has been advocated as a rapid way of stepping up food production since sugarcane occupies a large area in the state. It is a common belief that the setback, if any, received by the cane crop is ultimately made up during its long period of growth. As, however, no definite experimental evidence exists in support of the above statement, an experiment was undertaken on the cane crop planted during February, 1950, with a view to seeing whether this method could be profitable and could be recommended in the commercial cane culture.

Sugarcane takes about six to eight weeks to germinate and a further period of four to six weeks for tillering after which it starts its growth vigorously and sheds the ground completely. It was thus considered possible to take a catch crop of cereal which could complete its life cycle within about three months and accordingly maize was chosen as a subsidiary crop to be taken in cane. Maize seed was dibbled immediately after the planting of cane at a distance of 1 ft., 2 ft. and 3 ft. apart on the sides of the cane ridges diagonally opposite to each other. In the control cane crop no maize was sown. The cane crop was manured with 300 lb. nitrogen per acre given in the form of sulphate of ammonia and cake in the proportion of one part of sulphate of ammonia and two parts of cake on a basal dressing of 20,000 lb. of compost. The distribution of the top dressing was in four doses out of which two doses, equal to 150 lb. nitrogen were given during the life cycle of the maize crop. The variety of cane was Co. 419.

From the data obtained it was evident that while the germination of sugarcane was not in any way influenced by intercropping with maize in case of all the spacings, with regard to its tillering there was a progressive upward gradient with wider spacing of the maize crop. The highest tillering was, however, obtained in the control treatment.

With regard to the borer infestation, differences between the different treatments were negligible. The detailed study of the borer population, however, revealed that besides *Argyria* species, *Chinazonellus*, which is specific to the maize crop, was also observed to affect sugarcane. There was thus a possibility of increasing this pest on sugarcane if the intercropping with maize was followed as a common practice.

The maize crop was harvested when the cobs were dry. In the case of maize dibbled at one foot distance higher yields of both grain and fodder were obtained, which were about one third of the normal produce of maize sown alone.

The periodical growth studies indicated that there was deleterious effect of intercropping with maize on sugarcane. The cane crop was harvested when in full maturity.

From the harvest data it was clearly seen that the deleterious effect of intercropping continued practically till the harvest time affecting the final tonnages. The plot without maize had given significantly higher yields over the treatment with maize dibbled at 1 ft. and 2 ft. distance. In the case of maize with one foot distance this effect was visible even on the weight per cane. Coming to the analytical data, however, it was observed that intercropping showed beneficial

SUGARCANE CULTURE —
OWTH AND YIELD

PATWARDHAN

effect on sucrose formation resulting in almost equal yield of sugar in all the treatments. This clearly confirms that heavy inroad was made by the maize crop on the nitrogenous manures given in top dressing to sugarcane, a fact which adversely affected the production of cane tonnages but improved the quality of cane. According to the present system of sale of cane, however, the value of cane is fixed on the net weight of cane and not on quality and sucrose content of sugarcane and, therefore, the net resultant loss due to intercropping was 9.13, 7.93 and 5.43 tons of cane for 1 ft. 2 ft. and 3 ft. spacing of maize which when worked out in rupee value at the then prevailing rate (Rs. 52) came to Rs. 474, Rs. 412 and Rs. 282, respectively. The realizations from maize crop were found to be insufficient to make up the loss.

It was thought that the progressive fall in yields of cane in the intercropping cane treatments might possibly be due, to some extent, to the uptake by the maize crop of the fertilizers applied to the cane crop. The experiment was, therefore, modified in the second year by supplying an additional dose of 50 lb. nitrogen to sugarcane after the harvest of maize crop. It was intended to see if this additional dose could make up for the loss observed in cane tonnages. This experiment was started on December 23, 1951 and received normally 375 lb. nitrogen on the basal dose of 20,000 lb. of compost. The cane variety was Co. 475. The additional dose of 50 lb. of nitrogen was applied at earthing up time to half the crop, making the total dose to 425 lb. nitrogen per acre.

Although the trend of the yield of maize was practically similar to that observed in the previous year, the yields of fodder were very low which appeared to be due to low temperatures experienced by the crop in the case of early planting of sugarcane. As with the flowering varieties of cane early planting is very common, the yields of the maize crop are likely to be lower than those obtained in the February plantings.

The data relating to sugarcane practically confirmed the previous findings about the deleterious effect of maize crop on tillering. The borer infestation was, however, lower in the case of this early planting as compared to the one in the February planting of the previous season.

With regard to yields of sugarcane it was seen that the additional dose of 50 lb. nitrogen was practically insufficient to make up for the loss of vigour in the case of 1 ft. and 2 ft. spacings of maize. In the case of 3 ft. spacing, however, there was a beneficial effect of additional manuring resulting in an increase of 7.8 tons. The deleterious effect on the growth of the cane crop due to intercropping was found to continue practically till harvest time. The same trend was also maintained in the case of the additional dose of 50 lb. nitrogen although a better performance with regard to weight per cane was observed in the case of all the treatments.

CONCLUSIONS

The experimental work carried out during the two years has definitely proved the deleterious effect of intercropping with maize on cane yields. This deleterious effect was found to affect the tillering and the growth phases and continued practically till the harvest time. Among the different spacings between maize plants this adverse effect was found to be highly significant in the case of 1 ft. spacing. The additional dose of 50 lb. nitrogen at the earthing up time indicated a beneficial effect only in the case of 3 ft. spacing between maize plants resulting in practically equal yields with the control treatment. In the case of the treatments with 1 ft. and 2 ft. spacings the loss in vigour of cane crop due to very thick population of the

(*Contd. on page 31*)

DHURI COMMUNITY PROJECT ALLURING EXAMPLE OF SELF HELP

CONSTRUCTION OF 18 MILE LONG ROAD IN THIRTEEN DAYS

THE people of this project area are proving the maxim, "Man is the architect of his own fate." The entire population is fully convinced that this is a programme of their own. They have really understood the crux of the spirit of Community Project.

The vital impulse of self help has been kindled by the project staff to such an extent that recently more than 1,500 sturdy villagers went to work on 12 January, 1953, with shovels in hand to build an 18-mile road link between Malerkotla on one side and the Grand Trunk Road on the other. The Chief Minister of PEPSU, S. Gian Singh Rarewala, formally initiated this magnificent endeavour in self help by the villagers by plying a shovel amidst cheers from the crowds. The Development Commissioner, Sardar R. S. Randhawa and other officials were also present. People from 30 villages vied with each other in completing an artery of communication with the market town of Malerkotla. In an hour's time earth work had been laid over a stretch of about a furlong.

The link road which will serve 30 villages is perhaps the longest ever undertaken to be constructed by the people themselves in any part of India. Most of the villages in the area are inhabited by displaced persons from the colony area of Lyallpur, now in the West Punjab. They are making a demand of model villages to be planned as soon as the new road project is completed and it is heartening to see how their imagination has been kindled by vision of progress and prosperity. It is pleasing to note that the earth work (24 ft. in width and 1½ ft. in height) has been completed on this road.

A WORD FOR OFFICIAL CO-OPERATION

A mere 120 days after inauguration, villagers in the area of the Dhuri Community Project in PEPSU have found a new inspiration. The spirit of self help has come to stay. Poverty, indolence and scepticism about officialdom have all been overcome. Already dotting the landscape are numerous signs of the popular will to build a new village life.

Mr. Perry H. Jamson, American Extension Advisor who visited this area has made the following observations:

"Another outstanding spirit of co-operation is shown in the Dhuri Community Project. On January 29, His Highness, the Rajpramukh of Patiala travelled almost for the whole day over rough, dusty roads and drove his jeep for the purposes of seeing for himself that was going on in these projects which he had heard so much about and to encourage his people. There is no doubt that his many stops on the 29, January to chat with the farm people and to encourage them will do much to encourage the rural people to do still more to bring about better and more prosperous condition in the State of PEPSU. He got out at every stop and said a few words to the anxious people. His co-operation was much appreciated and will do much to help our programme. It is a real pleasure to work with people who cooperate like the officials of the PEPSU State do."

Mr. Douglas Ensminger, Representative for India has made the following remarks:

"I have just studied your progress report for the month of December, 1952. May I congratulate you on helping the people catch the spirit of helping themselves ?"

VILLAGERS' CONTRIBUTION

The 18-mile long road has been completed by the people of the nearby villages within a record time of 13 days. The burrow pits (422 per mile) measuring 20 ft. × 10 ft. were allotted family-wise in each village and every village did the earth work within the specified time. One burrow pit was dug 2 ft. deep, *i.e.* 400 cubic ft. of earth were dug for the construction of the road. If the total work done, *i.e.* digging of 3,039,400 cubic ft. of earth is evaluated it would have cost the P.W.D. a sum of Rs. 60,768 and instead of 13 days, thirteen months would have been taken. Taken in this sense cooperation of the people tantamounts to financial contribution, in this case, of the order of the above estimate. Besides, the villagers have given free land measuring 94 acres worth Rs. 1,17,500 for the construction of this road. They have suffered a loss of standing crops worth Rs. 4,650 so the total contribution in the form of voluntary labour, free land, loss of the standing crops, etc. comes to nearly Rs. 1,82,918.

AGRICULTURAL IMPROVEMENTS

Reclamation of waste land: 800 acres of waste land have been reclaimed up to this time.

Providing quality seeds: Wheat seed has already been distributed. Good varieties of cotton seeds such as 320F and 216F are being supplied to the cultivators and good variety of sugarcane is also being made available. Old varieties of sugarcane, *i.e.* Co.185, Co. 312 and Co. 317 are being substituted for by the new varieties such as Co. L. 9, Co. L.22 and Co. L. 30 but the most suitable new variety of sugarcane is Co. L. 9.

Fruit and fuel trees: The *sheesham* saplings are being supplied in lots to the villagers and arrangements for fruit trees are also being made.

Improved agricultural techniques: As many as 115 improved furnaces for *gur* making have been installed in this area and 150 maunds of ammonium sulphate have been distributed to the peasants. Five model farms have so far been established.

Compost manure pits: As many as 540 compost manure pits have been dug and 200 acres of land have been treated for anti-rat campaign. It has been demonstrated that vegetables should be sown in ridges and that green fodder can be made available throughout the year, and crust can be broken by 'bar harrow'.

(*Contd. on page* 32)

THE ROOT, STEM AND TOP BORERS OF SUGARCANE AND THE METHODS OF THEIR CONTROL

(*Contd. from page 21*)

pest at Gaya (Bihar). *Diatraea auricilia* is found in North India especially in Bihar and Uttar Pradesh. *Diatræa venosata* is a major pest in Madras only. It may, however, be emphasised that the biology of all the other stem borers are more or less similar to that of *Argyria sticticraspis* from the point of view of taking effective control measures in the field. Therefore the biology and control of only *Argyria sticticraspis* is described below.

The moth of *Argyria sticticraspis* is pale greyish-brown in colour and is inconspicuous against the withered dried up sugarcane leaves on which it generally rests on the under surface. The moth remains hidden during the day time and is only active at night when it oviposits on the leaves. Eggs are laid in clusters on the underside of the leaves near the mid-rib in two or three adjacent rows. The tiny eggs are oval shaped, scale like in texture and whitish in colour. The minute larvæ that hatch out of an egg cluster congregate together before parting company in search of food. At first they feed on the leaves and later on they bore into the stem from a tender portion. In young sugarcane plants the damage is characterized by the presence of a 'dead heart' almost similar to the root borer. In grown up canes the damage is conspicuous by the presence of many holes on the sugarcane stem from which the excreta of the borer as well as some froth is often times found exuding out. Several nodes in the cane is damaged by the borer which when the infestation is serious is capable of destroying the whole sugarcane plant. The full grown larva measures 25 mm. in length and is a voracious eater and the loss to the cultivator is often times great.

CONTROL MEASURES

(1) Setts should be well examined before planting to ensure that they do not contain any borer in any stage.

(2) Ratooning of cane should be avoided as far as possible.

(3) Light traps may be set up to trap the moths when the infestation is high and the collected moths destroyed.

(4) Egg parasite *Trichogramma evanescens minutum* Riley may be released if oviposition goes on at a high rate and many egg clusters are observed at any time. In fact when there is regular infestation by this pest the parasite *Trichogramma evanescens minutum* Riley may be liberated as a routined practice from the beginning of the cane season as soon as eggs are first observed.

(5) Two light earthings during the early stages of the crop may be given.

THE TOP SHOOT BORER

(SCIRPOPHAGA NIVELLA FABR.)

The top borer has been observed in all the cane growing areas of our country and within recent years has assumed the status of a major pest devastating vast areas. The borer causes serious damage to cane both in the early and later stages. The damage by the borer actually starts on the leaf commonly the third or fourth

leaf where it makes tiny holes and the presence of a series of small holes is a characteristic symptom caused by this pest. The moth with its silvery white wings are conspicuous in the sugarcane fields. The female moth lays a large number of eggs in clusters on the underside of leaves and covers them with buff coloured hairs from the orange coloured tip of her abdomen. These buff coloured egg masses are conspicuous objects against the green back ground of the cane leaves. The newly hatched reddish brown caterpillars tunnel through the third or fourth leaf and gradually enter the top shoot of the cane through the topmost node. In their journey towards the growing top many caterpillars perish. In each top shoot only one larva is found. The full grown larva is 25 to 35 mm. long and dull creamy yellow in colour. In the young cane the central shoot when tunnelled by the borer withers and the characteristic 'dead heart' is produced. In the later stages of cane growth the formation of dead heart is followed by the production of side shoots. These shoots sometimes appear in a bunch and are generally known as "bunchy tops". These are conspicuous in fields infested by top-borers.

CONTROL MEASURES

(1) Large scale campaign should be organized to collect the egg masses. As many of these egg masses are found to be parasitised by beneficial parasites, these should be conserved in wire-gauze cages from which the parasites that emerge from the egg masses can escape through the messes while the newly hatched caterpillars that crawl through the messes dropped down into a tray containing kerosinized water.

(2) Light traps should be set up to attract the moths when the infestation is heavy and the moths collected should be destroyed.

There are certain features in the life-history that are common to the root, stem and top borers. Their activity lasts from April to the middle or last week of October, when they pass into hibernation again to emerge as adults with the return of the warmth of spring. The life-cycles of these borers last from 45 to 60 days according to variation in the climatic conditions. All the borers live inside the cane for the major period of their life-cycle. Only the first stage larvæ of all the borers are found on the cane for a short period before they enter the root, stem and top shoots as the case may be. If by careful observations in the field we can determine roughly the periods when these first stage caterpillars will be found on the cane plants we can organize suitable methods of chemical control. Spraying with 0.25% DDT or 0.4 to 0.5% BHC will give satisfactory results in the control of these borers.

MAN OF THE MONTH

(*Contd. from page 6*)

with a portable engine of 5 H.P. In fact, it was on account of the tube-wells that it was possible to put in wheat after cotton on a tract of six acres.

HE STARTED FROM A SCRATCH

Through judicious land management Sardar Surindar Singh has turned unproductive land into a flourishing estate. He runs this Farm as an industry. "In fact," he says, "I want to show to the people that farming can be as comfortable and paying as any other profession. I started from a mere scratch here. My father had lent me money with which to buy machinery to develop the land and to build a house. At times, I also managed to get advances from the sugar mill on security of my standing crops. A good portion of this loan has already been paid back. A large part of the profit I plough back into my Farm to make it more up-to-date, for though people here consider me to be progressive, I think my Farm is far behind as compared to what I saw in the western countries."

HOST TO AMERICAN FARMER

At the time I visited Sardar Surindar Singh, he had an American farmer, Mr. John S. Boor, as a guest. He was in India as a representative of young farmers in the U.S.A. His visit to this country was sponsored by the International Farm Youth Exchange. Mr. Boor thought that Sardar Surindar Singh was very similar to a farmer in the U.S.A. in that he utilized his land most economically and efficiently. He was establishing good farming practices in this area which could be followed by other farmers in the region. It was a very pleasant experience to him living and working with Sardar Surindar Singh on his farm.

IS INTERCROPPING POSSIBLE IN SUGAR-CANE CULTURE—ITS EFFECT ON CANE GROWTH AND YIELD

(*Contd. from page 27*)

catch crop was of a permanent nature and the extra yield obtained due to additional manuring was insufficient even to repay the additional cost incurred on account of additional manuring. Good response of additional manuring was, however, obtained in the case of 3 ft. spacing of maize plants which has even given slightly higher cane yields (1.9 tons) per acre than the control treatment. It was, therefore, felt that this method of intercropping with maize at 3 ft. distance with an additional dose of 50 lb. nitrogen after the harvest of the maize crop would give a slightly higher profit per acre than the control treatment. It would be thus worth while to adopt it in the present state of the shortage of food although the total food production per acre would be low in the case of early planting of sugarcane. About 10 acres of sugarcane would give an yield of one ton of maize which would almost be equal to the yield of *rabi jowar* under rainfed conditions. In the case of later plantings of sugarcane, however, about 5 to 6 acres would produce one ton of maize grain.

DHURI COMMUNITY PROJECT—ALLURING EXAMPLE OF SELF HELP (*Contd. from page 28*)

Demonstrations are being arranged for reclamation of alkaline soils.

Consolidation of holdings :— The consolidation work has been completed in 65 villages of the First Development Block.

Key Village Scheme :—Three Hariana Bulls have been purchased through the Veterinary Department and one service crate, for the operation of training of bulls, collection of semen and artificial insemination has been constructed. The laboratory has been partially established. The Artificial Insemination Centre has been shifted to the veterinary hospital. Propaganda work has been started in the villages, Mandian, Bunga, Ranwan, Bhaini Kamboan, Banjholi Kalan and Sekhe.

PUBLIC HEALTH

The work of pavement of streets and construction of drainage will be taken up shortly. For the building of Child Welfare and Maternity Centre a site at Amargarh has been prepared by voluntary labour provided by the people of the respective localities who also worked out the details of work themselves. The dirty cesspool is a thing of the past now.

The Sanitary Inspector and Vaccinator are touring the villages for vaccination purposes. Small pox broke out in many villages but it has been controlled. Expectant mothers get advice from the Maternity and Child Welfare Centre at Amargarh.

EDUCATION

The 26 co-educational schools are showing good progress. More than 1300 school going children get their education in these schools. The attendance in the Adult Centres is, of course, low but in the coming months it is expected to be satisfactory as the agriculturists are now free from sowing work.

SOCIAL WELFARE

Youth Welfare Associations have been formed in 30 villages. Nearly 10,000 rural people attended the youth rally of the First Development Block which was organized on the Republic Day under the auspices of Dhuri Community Project.

Agricultural, veterinary and industries exhibitions were arranged on 25 and 26 January; 33 models of compost manure pits, improved *gur* making furnaces were exhibited. It was the first social *Mela* organized on a huge scale.

CO-OPERATION

Thirty cooperative societies in different villages have been constituted and extension propaganda is being carried out in the other villages.

QUESTIONS AND ANSWERS

Questions

1. Our attempt to get coconuts germinate by leaving the fruits in shady corners and young seedlings met with a high percentage of failure due to destruction by white ants. Sprinkling of salt water kept the insects away only for a few days. What is the best remedy ?

2. Also what is the best method for getting the fruits to issue shorts earlier ?

3. There are several mature plants in the low hills and foothills of the district, some of which bear only very few fruits while some scarcely ever had any. Any remedial measures to induce them to bear more fruits ?

(Agricultural Inspector, North Garo Hills)

Answers

1. Seed coconuts are best germinated by planting them in a sand bed of about $1\frac{1}{2}$ ft. depth and watering the beds regularly. The nuts intended for raising seedlings should be fully mature, having some water inside. They may be placed horizontally in the sand bed, about $1\frac{1}{2}$ feet apart. The top portion of the nuts should be about 2 in. below the top level of the sand bed. The nuts if watered regularly and carefully will germinate within 3 or 4 months.

2. If good river sand is used for the nursery bed, there will be very little white ant attack. Satisfactory control of white ants can be obtained by treating with Benzene hexachloride. One pound of the wettable formulation of B. H. C. (50 per cent.) may be mixed with 50 gallons of water and applied to the soil in coconut nurseries with a watering can at the rate of about one gallon per square foot.

3. The non-bearing nature of the coconut palms may be due to the use of inferior planting material. The palms may, however, be manured with 4 lb. of ammonium sulphate, 2 lb. of superphosphate and 3 lbs. of muriate of potash. The manuring may be repeated for 3 or 4 years. This may induce production of nuts.

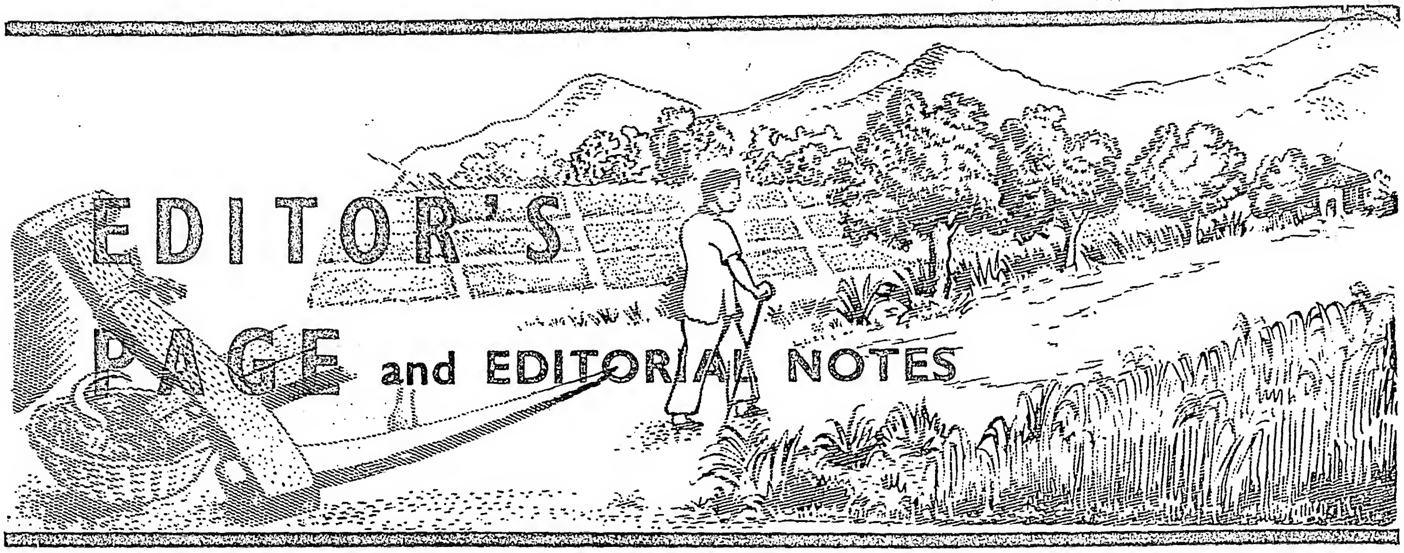
INDIAN FARMING

Vol. III New Series No. 2 May 1953

EDITOR'S PAGE AND EDITORIAL NOTES 2
MAN OF THE MONTH (Feature Article)—A. R. Vyas 4
GRAM WILT AND ITS CONTROL 7
THE RED PUMPKIN BEETLE AND ITS CONTROL—E. S. Narayanan .. 8
SMALL POX 10
DEHORNING OF CATTLE—U. P. Saha 12
MANURE IN PLENTY—B. L. Choudhari 14
WHEAT FARMING AND WHEAT FARMER IN AUSTRALIA
—K. G. Tejwani 16
MIRACLE PLANT—D. Chatterjee 20
POPULARISING BIKANER BREED—Sunanda Narayan 22
HOW TO APPLY FERTILIZERS—P. C. Raheja and H. S. Dhillon .. 24
ARTIFICIAL INSEMINATION OF CATTLE IN THE PUNJAB
—M. L. Kohli, R. M. Sharma and K. R. Ghulati 27
COWPEA—A HIGH YIELDING NUTRITIOUS FORAGE—H. C. Malik .. 30

EDITORIAL BOARD

PRINTED AND PUBLISHED BY P. H. RAMAN AT THE ASSOCIATED ADVERTISERS AND PRINTERS LTD., 505, ARTHUR ROAD, TARDEO, BOMBAY 7. (AGENTS FOR INDIAN COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI.)



Close on the deliberations of the Conference of Development Commissioners recently held in New Delhi, has come the approval of the Government of India for the formation of a National Extension Service. This new scheme, discussed by the Development Commissioners, was earlier recommended by the Grow More Food Enquiry Committee and appeared in the final version of the Five-Year Plan. It will not only integrate the community development programme during the Five-Year Plan-period, but will also encompass nearly 120,000 villages with an overall population of 80 million. In addition, within the area covered by the extension programme, intensive development work will be taken up in selected areas thereby making community projects a permanent feature of rural development.

By any yardstick the National Extension Service would be of paramount importance to rural development. It would make possible extension work and community programme run concurrently. To be carried out jointly by the Central and State Governments, the programme is expected to commence on October 2, 1953.

The scheme is an improvement on the present position of the community projects which is for a period of only three years. Secondly, it will establish a permanent machinery in the rural areas through which development work can be canalized. A fundamental change in the approach of the administration towards the people has, however, to be brought about, if the machinery is to be effective.

Under the new scheme about one-fourth of the country is to be covered during 1951-56. As chalked out at present, out of the 1,200 blocks which are expected to be taken up during the Five-Year Plan-period, 700 consisting of 70,000 villages and a population of 46,200,000 will receive attention under the community programme; while the remaining 50,000 villages and a population of 33 million will be taken up under the National Extension Service.

Many important aspects of village development were spotlighted at the Development Commissioners' Conference. It was frankly admitted that while spectacular results had been achieved in certain areas, there were a few areas where progress had been slow. It was also conceded that backward areas had to be improved as the programme envisaged a continuous national development.

Among the list of causes which have retarded progress in certain areas, the foremost is the insufficient importance attached to the community programme. The feeling was unanimous, that such apathy should be corrected.

Some of the remarks made at the Conference by Shri V. T. Krishnamachari, Deputy Chairman of the Planning Commission, deserve country-wide attention. That the achievement of physical targets alone was not enough, was emphasized by him more than once. It was of the utmost importance that the fundamental conception of the community programme was not forgotten; that it is a people's movement. Through these programmes rural populations were trying to improve their standard of living, perilously low, and

the role of the project authorities was to assist the development of this process. In this context emphasis must needs be given first to increasing avenues of employment and more production.

Shri V. T. Krishnamachari also stressed the importance of the cooperative movement. He went so far as to suggest that if possible every family should be brought into the cooperative movement. If, in the past, the cooperative movement had not made progress in certain areas, it was due to the lack of enthusiasm of the villagers. This aspect deserves the closest attention of village development authorities.

Some useful suggestions were made at the Conference for increasing production. These relate to the production of vegetables, poultry farming, development of manurial resources, the construction of compost pits for every house in a village, construction of houses with indigenous material, and building roads and bridges.

The real test of the success of the community programmes would depend on a change of outlook by every family, permanent arrangements for good seed, local manurial resources, etc. and the establishment of multipurpose cooperative societies and village councils for village development work.

A pointed reference was made at the Development Commissioners' Conference to the shortage of trained village workers which is particularly acute in some of the backward areas. Today, a large number of training centres exists where village-level workers are trained for later absorption in the community project areas. More institutions of the kind are of prime necessity to execute a national programme of this magnitude. That the Development Commissioners who met in New Delhi, have been asked to prepare plans for setting up institutions for training basic personnel in their areas, is an index of the importance rightly attached to the training programme.

One of the most important suggestions made at the Conference came from Shrimati Durgabai Deshmukh. It referred to the desirability of including as many women workers as possible in the community programme. She suggested that the Development Commissioners might request recognised women's institutions in the country to recommend suitable names. It is undoubtedly true that the life of a village-level-worker is hard, and yet without women workers in the villages, much of the developmental work particularly those in the spheres of social education and health, are likely to suffer.

(*Contd. on page 29*)

OUR COVER

The system of placement by desi plough is demonstrated. The ploughman carries the manure and pours out through funnel attached to the plough; the follower drops the seed in the furrow. (Refer article entitled "How to apply fertilizers" page 24)

Shri Eknath Tukaram Chaudhuri

MAN OF THE MONTH

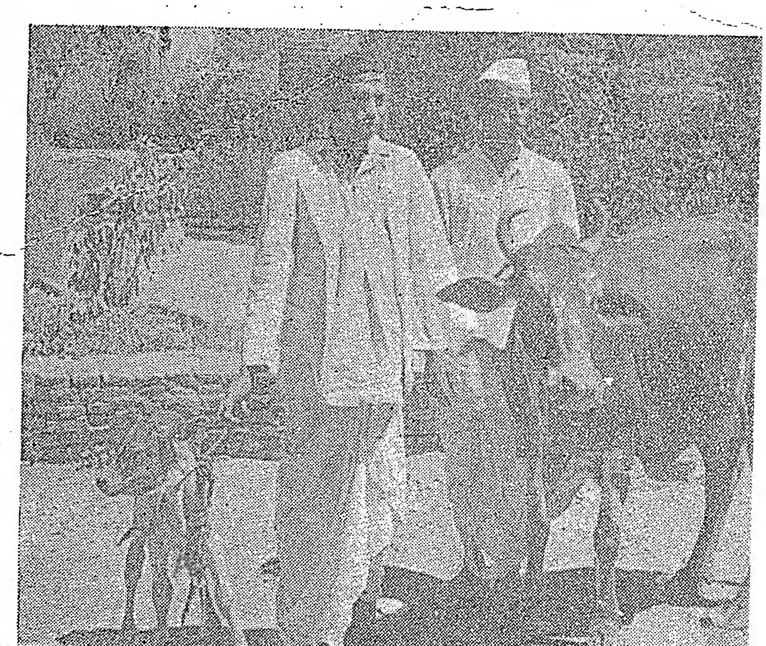
HISTORY LECTURER'S BID FOR CERTIFICATE OF *Krishi Pandit*

By **A. R. VYAS**

ABOUT 14 miles from the important railway junction of Bhusaval on the Indian Central Railway lies the small village of Atraval, in the Yawal tehsil of East Khandesh District on the border of South Gujerat. Here lives and works an erstwhile lecturer in history and economics but now a farmer, who bids fair to win the certificate of Krishi Pandit for his record yield of 8,331 lb. of jowar on an acre of land, during the khariff of 1952-53. He is 40-year old Shri Eknath Tukaram Chaudhuri, a hard-working Pattedar by birth, and an M.A., B.T. by education.

Through the courtesy of the Bombay Government I "jeeped" my way to Atraval last March over a metalled road and occasionally through a zig-zag dry river-bed. Despite the hard-baked fields, I was told that in these parts water was available at an average depth of 25 to 30 feet, and where wells had been sunk, agriculture flourished. The Atraval banana sells at a premium in North Indian markets, and dotted over the landscape, were the green banana cultivations, fruitful to their owners and restful to the eyes of travellers wearied by a fierce mid-

Shri Eknath Chaudhuri and his brother Shri Baburao with the prize-winning "Nimar".



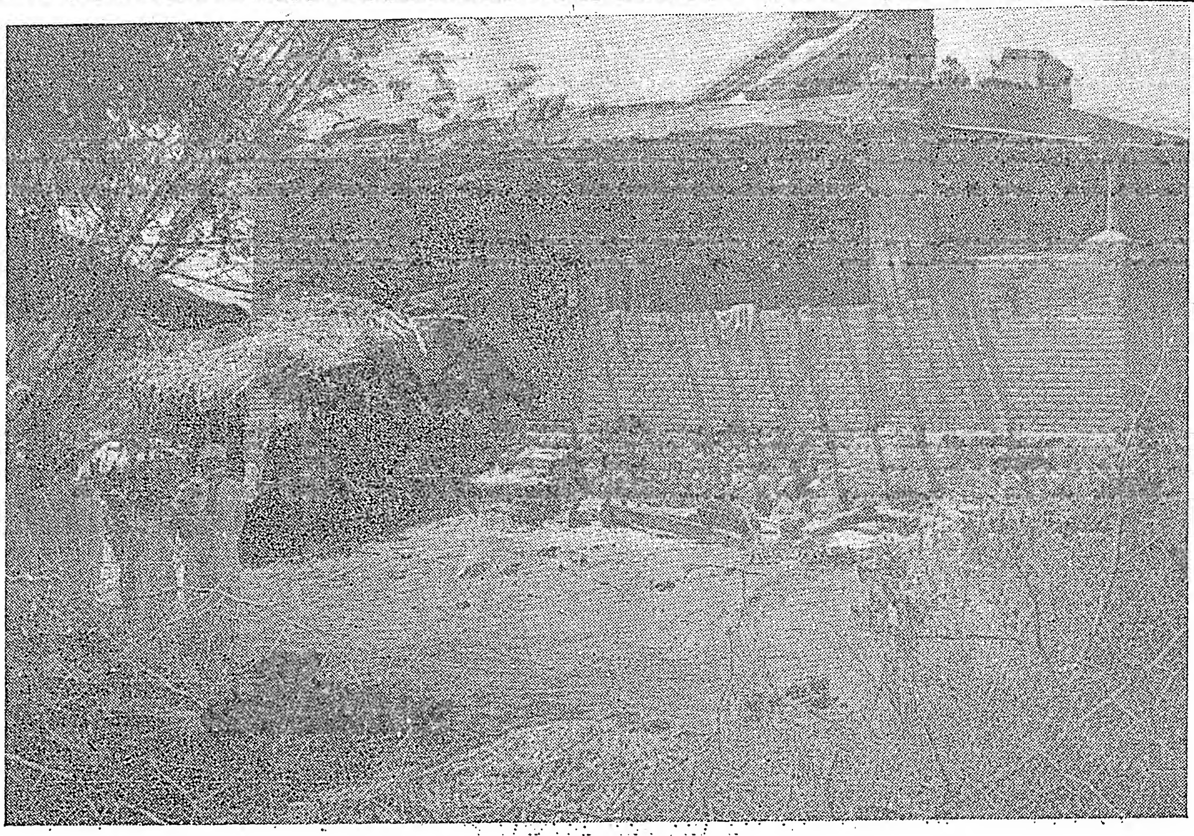
Shri Eknath, his 13-year old son and Shri Baburao his brother examine their wheat crop.

day sun. And wherever there was a banana field, there was the surface well.

As our jeep came to a halt under the shade of village trees, a crowd of people gathered round. In the forefront was a short, thin looking, white-capped figure, the subject of this article and my host for the day — Shri Eknath Tukaram Chaudhuri.

After the preliminary pleasantries, associated with the arrival of a city-bred into a village, I plunged into the subject of my enquiry. I was curious to know the reasons which had impelled my host to throw up a city job for all the hazards of agriculture, dependent upon the vagaries of the monsoon. We drank cups of tea, nibbled at fruits, dry and fresh, and—talked. Some of my earlier impressions, which I had formed before meeting Shri Eknath were wrong. I soon realized that the man I talked to was not a school-master turned farmer, but a farmer who had strayed into the teaching profession, and then come back to the calling of his ancestors—agriculture. Shri Eknath Chaudhuri's father was a farmer and so are his two brothers. For ten years he taught students history in the day, but in the mornings and evenings he cultivated fields, which he had taken out on lease! Even while preparing for his M.A. Examination, he did not forget to irrigate his ancestral lands. With

The prize-winning one-acre plot now under wheat



Shri Eknath's simple village home

one hand he turned over the pages of his history book, and with the other he turned the moat which brought water to his fields.

METHODS USED

After a stay of a little over two years in Surat, where Shri Chaudhuri taught history and economics at the M.T.B. College, he turned his back finally, on what he thought a blind alley. He found the climate of Surat unsuitable, and the call of the land was too powerful to be resisted. This was in 1950, when he took over the management of his 4-acre plot.

The one-acre plot which Eknath Chaudhuri entered for the competition, was land that had been intensively cultivated since the day he took charge of it. From the end of February 1952 till June the same year, it was under onions. After these had been harvested, the land was harrowed twice and applied 15 cart-loads of farmyard manure. The rains were late and scanty last June, Shri Eknath told me, and therefore he delayed the sowings till July 22.

"Any special variety of seed used," I asked, "and the rate of sowing?"

"I used a local variety called "Aispuri" at the rate of 10 lb. to the acre. The method used was drill sowing and space between the rows was about 14"," he answered.

In about a week, there were good rains for about 8 to 10 days which helped germination. The crop was thinned, leaving a distance of about a foot between each plant. Interculturing was delayed a little to check the height of plants, and weeding was done. Superphosphate was applied to the smaller, stunted plants at the rate of 40 lb. per acre.

This was followed by a second interculture. In September, the lower dry leaves were removed from the growing plants, and this practice was continued at weekly intervals

(Contd. on page 32)

GRAM WILT AND ITS CONTROL

IN the Punjab, gram is cultivated on 2.5 million acres and is thus next in importance to wheat as a food crop.

Its yield, however, is very low and in most areas is no more than 5 md. of grain per acre.

This low yield is due to a number of causes, but the most important is the wilt disease. This disease is not serious in irrigated areas but causes great loss in the dry districts of Ferozepore, Hissar, Rohtak and Gurgaon. In some years the crop is wholly destroyed by this disease and, on the average, the toll taken by it is not less than 15 per cent of the crop. The loss caused by this disease, therefore, is very great.

HOW TO KNOW GRAM WILT?

Gram wilt attacks the root system of the plant. As a result of this disease the roots of the plants turn black. They are unable to absorb water and food material from the soil and soon they die. The parts of the plant above the ground first turn yellow, then brown and last of all they wilt and dry up. Plants wilt and die both in the seedling stage and at the time of flowering.

WHAT CAUSES GRAM WILT?

Some believe that the disease is due to a fungus. Field observations, however, have shown that high temperatures at the time of sowing and flowering and lack of moisture in the soil lead to wilt in gram.

HOW TO CONTROL GRAM WILT?

In order to protect your crop against this disease you should do the following things:

1. You should take steps to retain all available moisture in the soil. This can be done by loosening the subsoil during the monsoon. After a rainfall of about a couple of inches during summer you should stir the surface soil with the country plough. Then you should make a ditch with a ridger attached to the horse-hoe.

2. After this has been done the soil should be dug up six inches or seven inches with a furrow-turning plough, like the Raha or the Hindustan. This roots out all weeds and the rain that falls soaks easily into the soil.

3. Towards the end of the monsoon the ploughed field should be stirred once or twice with the horse-hoe or the country plough. The land should then be left to dry for a day and then the wooden plank or *sohaga* should be run to level the land. The soil should finally be bar-harrowed and left till the sowing season.

The extra expenditure involved in ploughing one acre of land by the above method amounts to Rs. 20 and the net profit has been shown to range from Rs. 39 to Rs. 74 per acre in different types of soil. Moreover, the good results obtained in the reduction of the disease and increased yield from this practice are not confined to the first crop but are carried over to several years.

4. *Time of sowing*: Results of experiments carried on for a number of years have shown that you can lessen this disease of gram by sowing your crop a little later than usual. Farmers often sow gram when there is rain during the month of September. This is a mistake. You should sow your crop not in September but in the second or third week of October.

5. *Proper method of sowing*: The 'broadcast' method of sowing gram increases wilt disease. You should sow gram by the 'pora' method i.e. by pouring it through a tube tied behind the country plough.

As far as possible gram should be sown alone and not mixed with wheat, barley, or oilseeds. If mixed cropping cannot be done away with you should sow gram and the other crop in alternate rows and not mixed together.

6. *Improved variety*: G. 24, a brown-seeded strain of gram evolved in the Punjab, has been found to be most resistant to the wilt disease. If your crop is badly affected by wilt disease you should substitute this variety for the local gram.

7. *Time of irrigation—if available*: Gram in the Punjab is mostly grown in the dry unirrigated tracts of the State. If, however, irrigation is available then you should irrigate your crop, once during November or December. Results of experiments extending over several years have shown that by doing this wilt disease is reduced and the yield is greatly increased. You should not irrigate your crop during February or March as it will not be necessary and may harm your crop.

harm

SEASONAL PESTS OF CROPS:

THE RED PUMPKIN BEETLE AND ITS CONTROL

By

E. S. NARAYANAN

Head of the Division of Entomology, Indian Agricultural Research Institute, New Delhi

THE approach of summer is the time for the sowing of cucumbers and melons. A variety of cucurbit vegetables are also sown at about this time. The cucurbits are very sensitive to cold and can bear prolifically only when there is plenty of sun and air. So early in spring the cultivator assiduously prepares his land to sow his cucurbits so that he may sell the cool cucumbers and the luscious melons in the nearby city markets in the scorching heat of the summer months of May and June when they are in great demand.

Chrysomelidae

The red pumpkin beetle *Aulacophora foveicollis* is a relentless and destructive pest of all cucurbitaceous plants especially in the nursery. The adult beetles appear on the germinating plants by the beginning of March or earlier if fairly optimum temperature prevails. They rapidly increase in number by about the middle of April and cause serious damage to young plants of cucumbers, melons, watermelons, gourds, *tindas*, *ghiatories*, pumpkin, etc. So far it has not been observed to cause any damage to *karela* plants. Except perhaps in the hilly tracts, the pest has been recorded almost from all the States in the Indian Union where cucurbits are grown. An allied species, *Aulocophora atripennis* Fb. also occurs in North India in association with *Aulocophora foveicollis* but this species is easily distinguished from the latter by its black colour. Moreover its damage is also much less pronounced than that of the red pumpkin beetle. Outside the Indian Union the pest has been reported from Ceylon, Australia, Mesopotamia, Sudan and the shores of the Mediterranean sea.

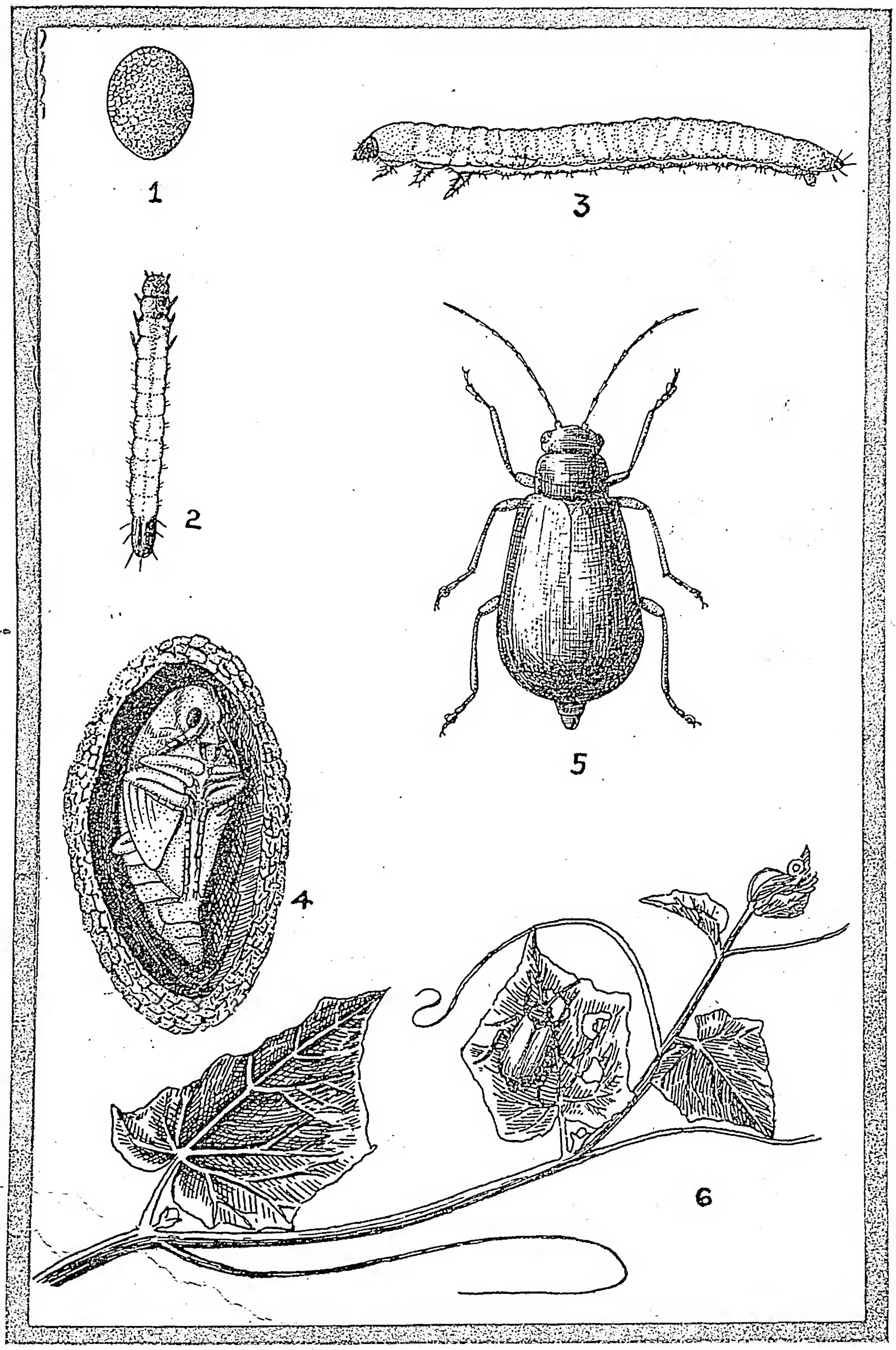
As has been already stated it is not only the cucurbit vegetables that suffer destructive loss due to the damage caused by this beetle but oftentimes extensive fields of melons are also completely devastated. If the adult infestation is serious at the early stage of the crop, the crop may completely fail.

The adults mate readily soon after emergence and the females usually start laying eggs in about a week's time after mating. Eggs may be laid singly or in clusters and they are generally laid at night. Eggs are invariably laid on the surface of moist soil round the base of the plants, in cracks or on small clods of earth under the plants in shady places. One female may lay as many as 300 eggs in 8 or 9 batches. The freshly laid eggs are yellowish in colour which gradually turn orange. They are somewhat spherical in shape and each measures about 0.6 mm. in diameter. The eggs hatch ~~out~~ in 6 to 15 days depending on the prevailing temperature and humidity. The freshly hatched larva is slender in form and is about 1.2 mm. long and about 0.28 mm. broad across the body. The full grown larva measures about 12 mm. in length and 1.6 mm. long and about 3.5 mm. broad across the mesothorax. The adult beetle measures 5.5 to 8.8 mm. in length and 2.3 to 3.5 mm. in breadth.

The newly hatched grub is very active and it immediately bores into the roots or stem of the cucurbit plants. In plants bearing fruits, the damage by the grubs is also extended to those fruits that just touch the soil. Secondary infection by fungus has also been observed in the damaged area of the fruits. The grub period lasts for as many as 23 days under favourable conditions. When full fed the larva leaves the plant or the surface of the soil and pupates under the soil at a depth sometimes extending up to 10 ins. While pupating the larva builds a water-proof cocoon to protect itself from irrigation water. The pupal stage lasts from 7 to 17 days depending on the temperature and humidity of the soil. The adults normally live for over a month and the total life-cycle occupies from about 60 to 85 days. There are five generations of the pest during one year.

Though they appear in March the activity of the pest may be said to last for about six months from April to the end of September. The adult beetles go on feeding on the soft and tender leaves of the cucurbit plants, sometimes completely defoliating it and bringing about its total destruction. From October onwards the activities of the adult beetles slow down and by November they enter into hibernation. The beetles usually hibernate singly or in groups under any dried twigs, leaves, or other vegetation. The hibernation period lasts for about four months and the beetles begin to appear again in March.

As the beetles coming out of hibernation in the spring are most destructive and the source of future troubles, all efforts should be made to control this pest just at the very outset.(1) All old creepers, grasses, bushes, etc. which serve as shelter for the hibernating beetles should be collected and burnt in time. So far as the adult beetles are concerned, they can be collected in large numbers during the early hours of the day when they are generally inactive and destroyed. (2) Dusting with Paris green mixed with ashes or fine dust in 1 : 8 ratio by weight gives quite good results.(3) Dusting with lead arsenate in proportion of 1 : 30 also gives satisfactory results. Dusting with Paris green or lead arsenate should be done early in the morning and should be repeated every week if the infestation is high.(4) So far as the grubs and pupæ are concerned the only feasible method of control is to thoroughly plough the field after the spring crop is harvested.(5) Pouring strong tobacco decoction round the roots of the plants is also helpful in destroying the grubs and pupæ to a certain extent.(6) Dusting with some of the recently discovered organic insecticides like DDT or BHC in very weak doses, say 3 per cent has also given encouraging results recently. It has however been observed that the cucurbit plants are very sensitive to these organic insecticides and in many cases of dusting phytotoxic symptoms have appeared. If therefore dusting by these organic insecticides is resorted to, it should be done with utmost caution under expert supervision. It may however be emphasized that it is far safer to resort to the old and well tried inorganic insecticides to deal a pest of this kind than the recently discovered organic insecticides, whose residual effects on fruits and vegetables last long and whose exact nature is not yet clearly known.



AULOCOPHORA FOVEICOLLIS LUCAS

1. *An egg*
2. *A young grub*
3. *Full grown grub*
4. *Pupa in cell*
5. *An adult beetle*
6. *An adult beetle feeding on a leaf*

SMALL POX

★ SMALL-POX IS A HIGHLY INFECTIOUS DISEASE CAUSED BY A TINY ORGANISM KNOWN AS VIRUS

IT begins with fever, body ache and severe headache. The fever lasts for three days and subsides when a rash appears on the body. The rash starts on the face and is most prominent on the face, arms and legs. The skin breaks out in small red eruptions which become bigger and change into blisters filled with fluid which later on turns into pus within a week. When the pustules (pus filled blisters) appear, the temperature again rises and remains for a week.

An unprotected person develops symptoms of small-pox in about ten days after he has come in contact with an infected person and the virus has entered his body.

THE GREAT DANGER OF SMALL-POX IN INDIA

In spite of the fact that medical science has long possessed a safe and effective means of preventing small-pox by vaccination, we have failed to take full advantage of this, with the result that several thousands of cases of this disease occur every year in India out of which more than half prove fatal. It has been observed that out of a 100 small-pox deaths in our country 20 children die before the age of one year, while more than 30 die before the age of 10. From this it can be seen that small-pox is deadliest to children. The protracted course of this disease and the resulting suffering of the afflicted is unbearable.

SMALL-POX IS A CURSE

What happens to those who survive an attack of disease ? The deep scars or "pock marks" of small-pox left on the face and other parts of the patient's body disfigure him and mar his appearance. At times disfigurement of the face may prove a disqualification in securing a job. A serious attack of small-pox may even result in leaving the patient blind or deaf.

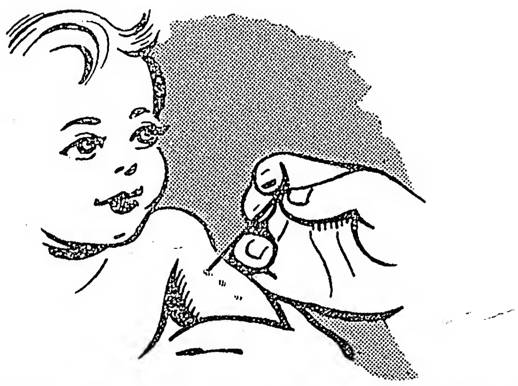
WHEN AND WHERE SMALL-POX STRIKES

Small-pox can strike people of all ages, but it is more often fatal to young children, and is most prevalent during the cold season. It usually starts in November and lasts till May, with January and February as the peak months.

HOW SMALL-POX SPREADS

The virus that causes the disease lives in the skin eruptions and discharges from the nose and throat of the affected person who can transmit the disease from the very day he falls ill. Since the virus lives only a short time outside the body, the disease is most often spread by direct contact with an infected person. Another possible means of transmission is by air or dust ; the scabs, if allowed to drop off anywhere indiscriminately, can be highly infectious as the particles of these scabs

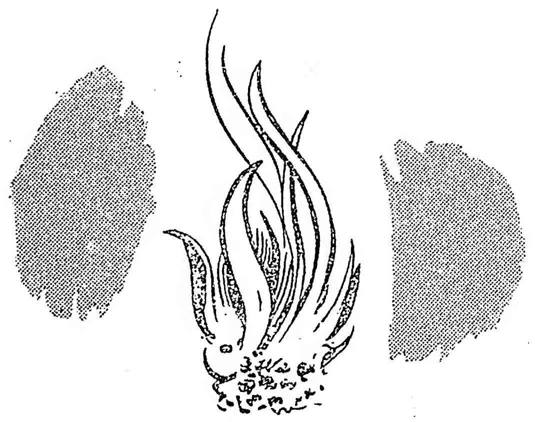
* Contributed by the Ministry of Health, Government of India.



which contain the virus can be blown around by the wind and infect healthy people. The small-pox virus either from the articles contaminated by the sick person or in the dust may be easily carried straight into the upper respiratory passage by the apparently harmless habit of picking of nose. This habit should be avoided particularly during small-pox epidemics.

TREATMENT

There is no specific cure for small-pox. Competent medical treatment will, however, make the patient more comfortable and protect him from possible complications. All cases should be isolated either in the hospital or in a separate room at home and the nurse or mother, as the case may be, should always disinfect her hands and clothes after touching the patient. All the utensils should be kept apart. Proper nursing is essential. A case of small-pox should be notified *immediately* to the nearest Health Authority and no visitors should be allowed. When the scabs start separating from the body, they should all be carefully collected and burnt. All clothes and bedding of the patient should be boiled, washed and aired in the sun.



FACTS ABOUT VACCINATION

Vaccination is a safe and simple procedure. A small amount of small-pox vaccine is painlessly introduced into the skin. In a few days, if the vaccination 'takes', the spot where the vaccine was introduced becomes inflamed and swollen and an eruption develops. This area should be kept clean and dry until the scabs fall off in about three weeks' time and no dressing should be applied. Medical research has proved that vaccination provides immunity for at least 5 to 10 years or even longer.

WHEN TO VACCINATE

All infants should be vaccinated before they are one year old, preferably between three and six months. This is the age when an infant cannot scratch and does not feel pain. The earlier the vaccination is done the better, as one can never say when small-pox may strike at a baby and bring suffering and disfiguration or even death.

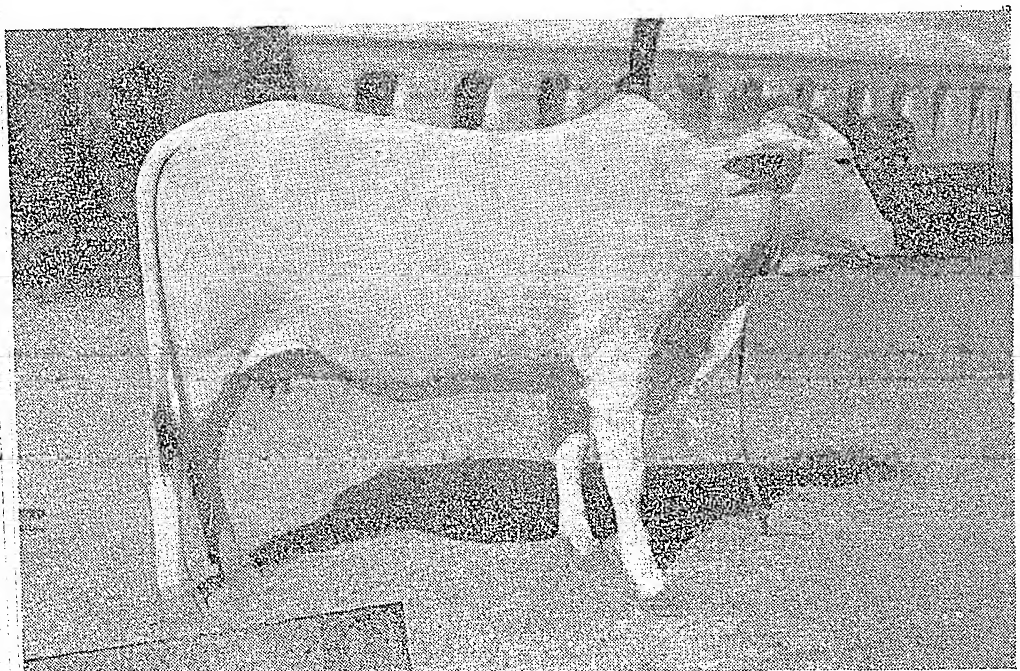
It is advisable to get re-vaccinated during epidemics if the last vaccination was more than three years ago and it is also better to get each child re-vaccinated before he starts going to school.

ONLY VACCINATION CAN SAVE

There is only one sure way of protection against this dread disease and that is vaccination. We can best serve the cause of health if we vaccinate all children within a year of their birth and if this done systematically and conscientiously, small-pox will ultimately be eradicated from our country. We must all cooperate in this campaign to safeguard and protect the health of our future generation.

Every Health Department in every State has arranged for vaccination facilities within easy reach and trained vaccinators are always ready to render all possible help. It does not cost anything, but the price paid for neglect may be the life of a dear one. Remember that it is an anti-social act to hide a case of small-pox from the local Health Authority for this endangers the life not only of the patient but also of the other members of the family and his neighbours.

dehorning



Dehorned cow

2

3

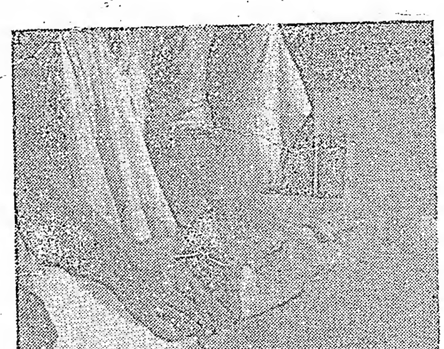
★

1 Horn bud
2 applying caustic
3 dehorned heifer

★

THE most spectacular type of the natural weapon of defence is, of course, the horns of the quadruped. Every one has been impressed by the great variety of horns in severals pecies of mammals. There is difference in shape, size and dimensions from breed to breed and in individuals as well. Perhaps it will take a dizzy pace to go into its origin. It is not known at what stage of development the cattle developed the horns, and what effect the long process of domestication had on them. The hornless cattle generally known as the polled cattle were found in Egypt as far back as 2150 B. C. (Hammond—1950). The Mohenjodaro bull possessed very long and well-shaped horns possibly in 500 B. C. or so. However, it is believed that polled varieties evolved as a mutation from the horned varieties. In the dairy world there is a great tendency to like polled cattle which is understandable on many scores. The polled cattle could be raised by selective breeding of animals naturally hornless over many generations, and it is a long long drawn process. However, in order to satisfy the immediate need of dairymen, polled variety could be obtained by artificially dehorning the young calves. Under the present system of

Horn bud



Applying caustic

# of cattle

By **U. P. SAHA,** Government of India Cattle-cum-Dairy Farm, Karnal

stall feeding of dairy cows, their horns become a source of danger than anything else. Some of the finest cows have lost their mammary glands as a result of injury from the horns and since man is taking care of them, they do not need them any more. This article will deal with one of the important methods followed by successful dairymen in many parts of the world. Anyone who could judiciously follow the technique would have a polled herd thereby minimizing the incidence of udder and other baneful injuries and the consequent mastitis.

The application of chemicals such as potassium hydroxide (caustic potash) or antimony trichloride over the 'horn-bud' of young calves, use of electric dehorners and surgical operations at later stages, are the methods employed in producing a polled herd.

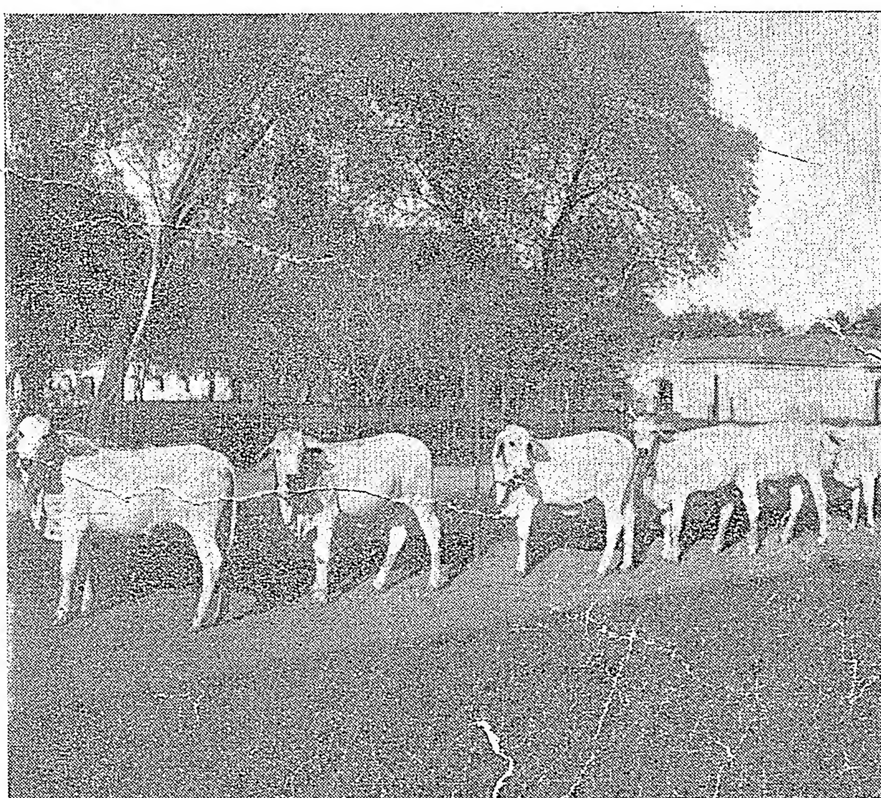
PROCEDURE

The dehorning of young female calves between the ages of two to three weeks gives excellent results and the technique is also simple. With caustic potash stick the 'horn-bud' could be cauterized and further development of the horn arrested. The 'horn-bud' is a dermal growth, later development enables it to get attached to the skull bones and become part and parcel of it. However, a small percentage does not get attached to the skull bones but remains mobile. The 'horn-bud' by palpation should be located and the hair around it clipped close to the dimensions of a silver rupee coin. The perimeter of this clipped circle should be smeared with vaseline and the 'horn-bud' cleaned with a little spirit and a drop or two of water placed over it. With a caustic potash stick rub the 'horn-bud' with a circular motion for a minute or two till the top layer is pealed off leaving a raw reddish surface. Too much rubbing should not be done since that will lead to bleeding. At the same time there should not be any part of the 'horn-bud' left out since that will tend to grow. After the complete removal, dust the area with zinc oxide and wipe off the vaseline. The calf has to be kept tied up for a day or two in order to prevent any injury to the treated part. During this operation the calf should be kept under restraint. Caustic potash is painful and antimony trichloride is less painful. Any of them could be used for this purpose depending upon their availability.

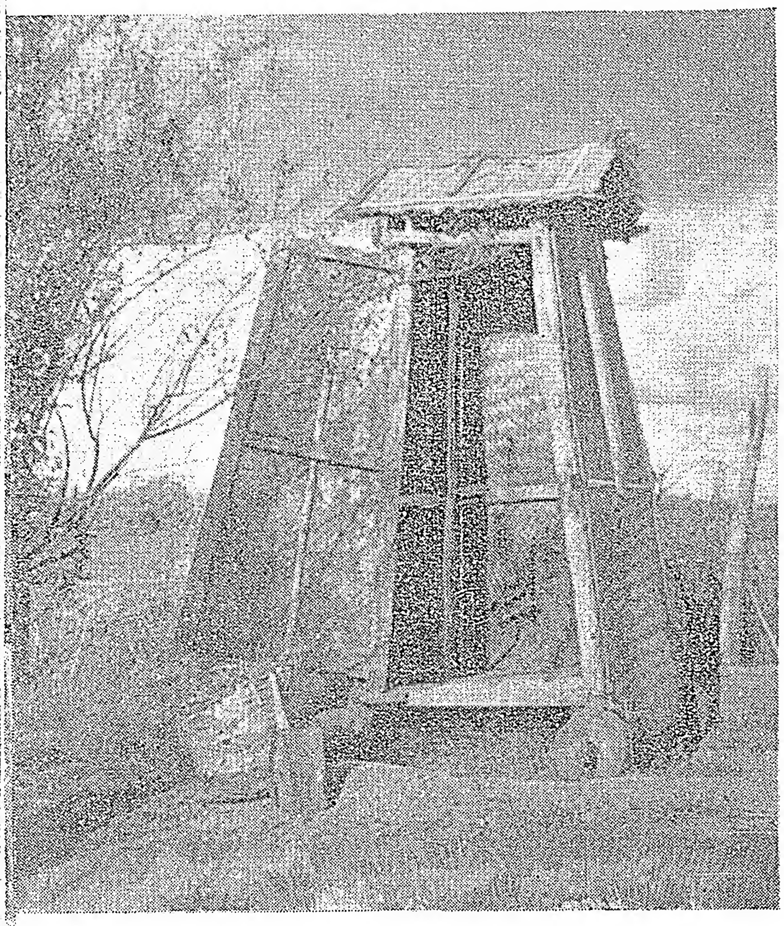
Dehorning at adult stage needs surgical operation and there is the risk of profuse bleeding.

The dehorning of female calves is advisable on economic and safety considerations. It prevents injuries to the animal, chances of horn cancer and injury to the attendants. It further tends to make the cows more docile and easy to manage.

Bunch of dehorned heifers



Caustic applied



Family privy in the backyard garden

MANURE IN PLENTY

By **B. L. CHOUDHARI**

THE attainment of national government in India has focussed the attention of the people towards the development of the Indian villages. It is the main part of the Five Year Plan and the development scheme launched in the country. These projects will tackle the various problems of the villages. One of the most important problems that will confront any village worker is the dirt and filth lying scattered all over the village. There is no proper and productive provision of its disposal with the result that it becomes a source of various diseases. Diseases mean impoverishment and heavy economic loss. The approaches to the village are offensive. Dirt and degradation go together.

This liability can be turned into a most valuable asset. How? By converting it into organic manure compost.

In order to make up her food deficit India must increase the per acre production of grain. At present it is too low as compared with other countries.

There are various causes of such low yields in India. An important one of them is poor manuring. Whenever a suggestion to manure the crop is given to a farmer he expresses his inability to do so due to high cost. It is so if he has to purchase the manure but little does he realise that he is wasting tons and tons of important organic manure in allowing the night soil and the urine to go waste and spread diseases. They are very rich in manurial contents as follows:—

Percentage of	*Night soil*	*Urine*	*Both combined*
Water	72.2	96.3	93.5
Organic matter	19.8	2.4	5.1
Nitrogen	1.0	0.6	0.7
Phosphorus	1.1	0.17	0.26
Potash	0.25	0.2	0.21
Lime	0.62	0.02	0.09
Magnesium	0.36	0.02	0.06

It is because of this richness that the manure from these is known as 'sonkhat'—golden manure.

SEVAGRAM EXPERIMENT

A system of making manure from the night soil and urine has been evolved at Sevagram. The experiments were conducted with definite aims of productive disposal of the night soil and to relieve the sweeper from this inhuman work so that his services can be utilized for other better works in order to gradually raise his social status.

As a result of these experiments a model 'sandas' (latrine) has been evolved which has the following advantages:—

1. During the whole manipulation night soil is not touched by hand
2. There is no fly menace
3. The excreta always remains covered and never presents an ugly sight
4. A manure of high quality is produced in the shortest time
5. It is cheap, simple and easy to construct

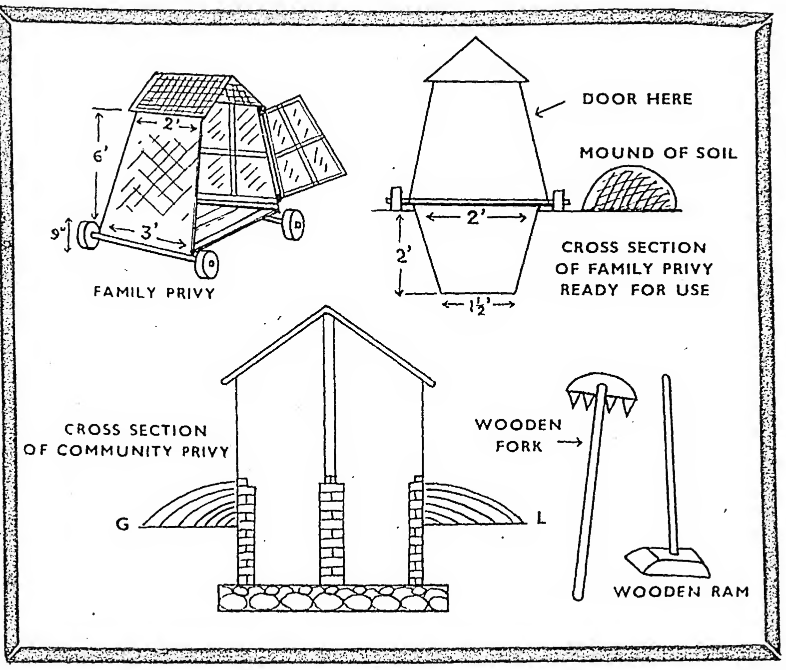
TYPES

There are two types of this 'sandas': (1) a single cabin like structure meant for a family and (2) a battery of such structures, having 6 compartments and is meant for a community of 50 to 60 people.

Both types of latrines consist of two parts: (1) the trench in which the night soil and urine falls and (2) the superstructure for privacy.

FAMILY LATRINE

It consists of a superstructure kept over a trench. The trench may be 8 to 12 feet long, 2 feet wide and 1½ to 2 feet deep. The bottom width of the trench should be less than that of the top. If the sides of the trench are perpendicular they may show a tendency to collapse and the superstructure may become unsteady. The soil taken out of the trench should be drawn in a ridge form towards the frontside of the superstructure.



The superstructure for such a latrine is a square cabin made of matting on a wooden frame and provided with wheels on which it can easily be moved. The structure is broader and heavier at the bottom so that it may not be easily blown down. The accompanying sketch gives detailed measurements and idea of its construction.

The seat for squatting consists of a few wooden planks nailed to the bottom with a convenient size of opening in the middle.

COMMUNITY PRIVY

This consists of a double battery of such structures made in one over a pucca trench. The total depth of the trench is four feet. Out of this only 2¾ ft. is below the ground level and 1¼ ft. above the surface. The width of the trench should be 2¼ ft. It is convenient to have six compartments each of 3 ft. width. The seats consist of wooden planks kept over the trench for which a grove is provided on the top as is shown in the accompanying sketch. The planks of seat should be 6 to 8 inches wide, one inch thick and 2½ ft. long. For the sake of economy it is suggested to have two trenches side by side with a common middle wall. The night soil and urine has corroding action. It is therefore necessary that the walls and the bottom floor of the trench should be built with brick in lime mortar. Cement should not be used.

Location for the community privy: It should be located on a high ground at least 100 ft. away from the residence and any well and should be on the side of the village away from the prevailing wind.

MANIPULATION

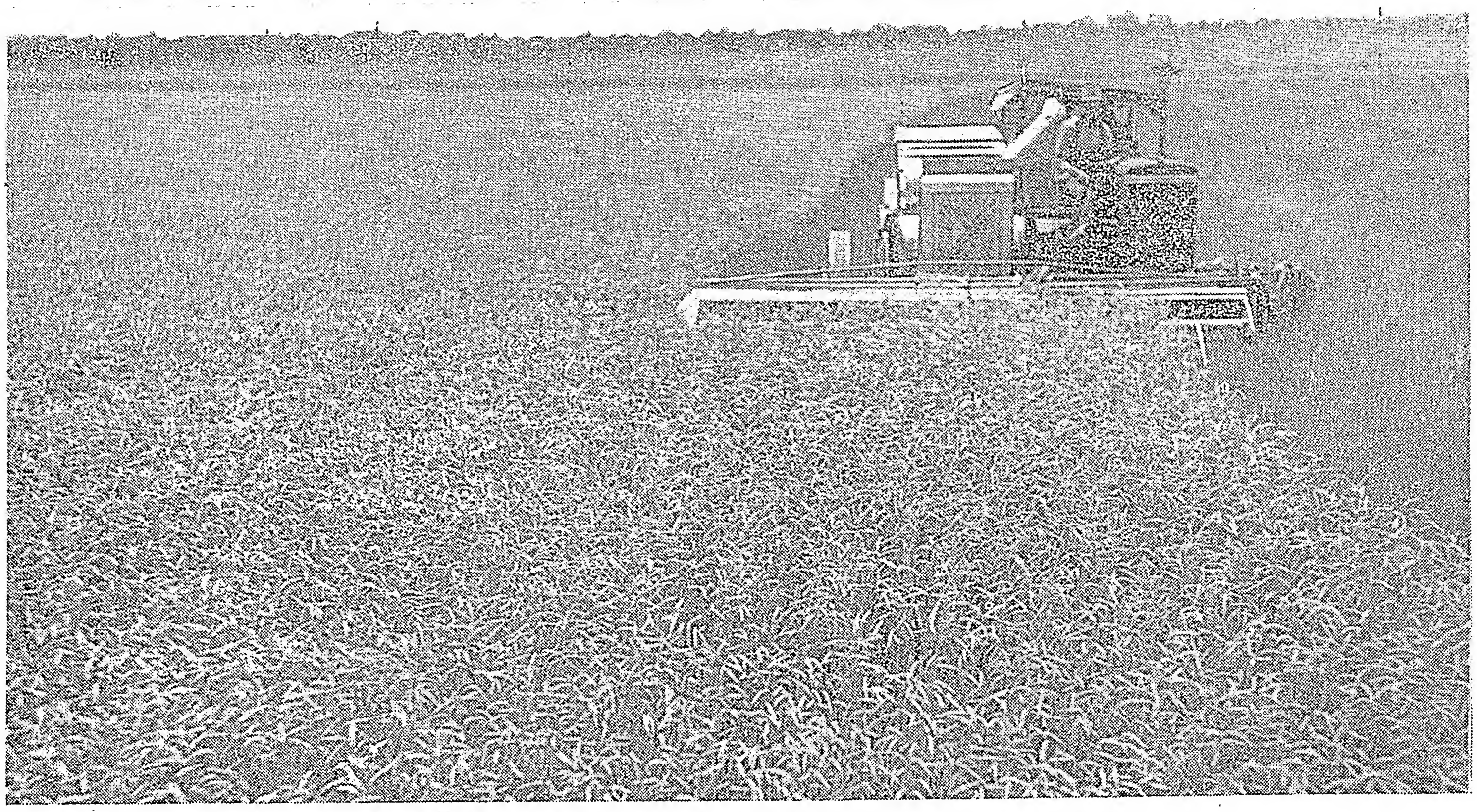
The method of using both types of latrines is the same. Before using a thin layer of grass is spread in the trench. The latrine is then ready for use.

Every one who uses it should after using it cover the night soil with a handful of dry soil. The dry soil of the trench piled near the family 'sandas' is utilised for this purpose. In case of community privy dry soil is kept in baskets inside the 'sandas' ready at hand for use. As much of dry grass, rubbish, weeds, etc., as available, should be used to cover the night soil. This helps in checking down the offensive smell and increases the quality of the manure.

Every day the contents should be spread out level with a wooden rake, covered with a fresh layer of vegetable rubbish, and lightly rammed.

Close the section when it is full for about three months and start another. In case of the small family privy move on the structure further on the trench. The manure is ready in about 2 to 3 months after closing. It may then be dug out and used.

A pucca community privy



A self-propelled heading machine operating on an Australian wheat farm

WHEAT FARMING AND WHEAT FARMER IN AUSTRALIA

By K. G. TEJWANI

A transport lorry following the combined harvester-thresher through the stubble to collect the bagged wheat and deliver it at the railway

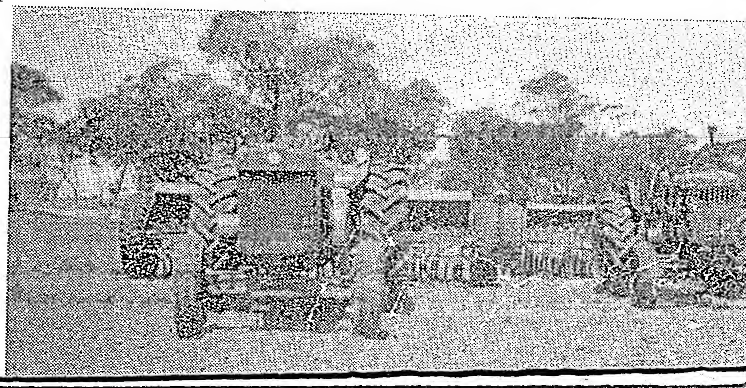
An Australian wheat farmer checks the quality of the crop being harvested while his assistant fills the bags with the grain

On alighting from the bus on my way to Bute, South Australia, to pass a couple of days in the midst of a wheat and sheep farming community, I was greeted by the cheery and winsome smile of Mrs. Heinrich who had come to meet me. Though by that time I had been in Australia for more than one year and had taken a number of pleasure trips through the countryside and had been told about the efficient wheat farming methods and great prosperity of the farmers, this was my first opportunity to come in direct contact with the people who were the backbone of the industry. Having been used to the subsistence farming methods of Indian agriculture and the chronic poverty of the Indian farmer, I was indeed pleasantly surprised to meet the wife of an Australian wheat farmer, tastefully dressed in an attractive spotted sundress, having a full head of hair, neatly pleated and folded and with an expression radiating happiness and geniality. From that moment onwards there was in store for me a long series of valuable experiences and pleasant surprises about their ways of farming and their way of life.

Mrs. Heinrich led me to her waiting car—a big De Soto Saloon—and whisked me along a gravelly road at 55 m.p.h. toh er farm about 20 miles away. Soon we reached the farm house—an imposing one-storeyed stone building with sloping galvanized iron roof—nestling in the shade of gum trees. Mr. Heinrich was still busy harvesting wheat, as was evident from the silent thud of the tractor in the field. The farm house had a covered verandah all round to keep it cool during the hot sunny summer and a patch of flower beds in the front and kitchen garden in the back, a testimony of the inborn love of the Australian for flowers and home gardening. We entered the house [illegible] from the back door and sat down in the kitchen to quench our thirst with cold beer—the A[illegible] Australian national drink. Mr. [illegible] Heinrich had seen the car arrive and after about 15 minutes he walked into the kitchen in his working togs, covered with tractor [illegible] and wheat chaff and oil and grease [illegible] had a dust from head to feet. [illegible] face, weather-beaten light brown [illegible]

House of a wheat farmer. Wind mill in the background generates electricity. Tractor and utility car in front

Seeding implements for sowing wheat on the Heinrich Farm



big sturdy strong hands and an appearance of intelligence and well being and prosperity and contentment. After drinks we set out in a truck to see the farm.

SOIL AND CLIMATE

The landscape where vast expanses of golden, sun-kissed wheat fields intermingled with large patches of bare red-brown soil to be seeded next season, presented a chequered appearance. As far as the eyes could see there were fertile fields of wheat one after another, delineated only by the wooden fences, till they merged with the distant shimmering purplish grey horizon. Australian wheat is grown in a 'wheat belt' extending from the east through New South Wales to Victoria, South Australia and Western Australia in the west. On an average wheat occupies about 50 per cent of the cultivated agricultural land, the actual acreage depending upon the season and economic conditions of the world, since next to wool, wheat is the most important item of Australian export trade, 1/2 to 3/4 of wheat produced being available for export. The soil and climate of this zone are exceptionally well suited for the wheat culture. Wheat is a dry crop in Australia. The rainfall of this belt is 10 to 25 inches most of which (8-20 inches) is distributed and concentrated in such a way that it is received during the wheat growing season. Due to prevailing low temperatures at that time very little of the precipitation is lost by evaporation. In some parts of South Australia wheat is grown where rainfall is as low as $7\frac{1}{2}$ inches during the growing season. The Australian plant breeder has served his country well by producing some good drought-resisting wheat varieties which have opened up vast areas of land which otherwise would have been considered hopeless for the plough. The winter temperatures are not so severe as to inhibit the growth of the crop, while the onset of the hot, dry summer at the end of the growing season facilitates early maturity and harvesting without any risk of rain.

HEINRICH FARM — TYPICAL AUSTRALIAN 'SMALL' FARM

Heinrich farm was about 800 acres in area. Most of the Australian wheat is produced on 'small farms', 600 to 1200 acres in area, which are worked by the owners or share farmers (share farmer is responsible for labour and production while land, equipment and finances are provided by the other partner). The wheat land is characterized by gently rolling topography which makes large scale mechanization possible. The combined harvester-thresher was still indefatigably at work, reaping and stripping and threshing and bagging the wheat. It is indeed a boon to the Australian farmer contributing in a large measure to low production cost and his general prosperity. Heinrich farm like any other farm was making full use of all the modern improvements in mechanized agriculture; it had its own tractor, combined harvester-thresher, all cultivation implements and accessories, two trucks, a set of spare parts and workshop. Because of the complete mechanization a farmer is able to manage 600 to 800 acre farm single handed. The average yield of wheat is 16 to 20 bushels (i.e. 1000-1200 lb.) per acre though there are certain wheat areas like Wimmera in Victoria and Riverina in New South Wales where average yields of 30 bushels per acre are frequently obtained.

Presently we arrived in a fenced paddock in which about 500 head of sheep were grazing on the scorched stubble. Seeing us approach they scampered together, retreated and stood in frightened little groups watching us enter the paddock. Most of the wheat farms follow the monocultural system, i.e. wheat is grown during winter, leaving the land fallow in summer, year after year. This single crop farming system is risky during drought years and detrimental to the natural soil fertility. During recent years due to the prevailing high prices of wool, a number of farmers have taken to mixed wheat and sheep farming. Mixed farming of wheat and sheep is a profitable and sound agricultural proposition. The care of the sheep, their shearing, rearing of fat lambs, etc. do not interfere with wheat culture, while they definitely add to the income of the farmer by way of wool and lambs and to the soil fertility by way of manure which is so very essential for the land. The soils are generally deficient in nitro-

gen and phosphorus while, potassium is present in sufficient quantities. Wheat is always fertilized with superphosphate to meet the phosphate deficiency in the soils, while nitrogen status of the soil is maintained by leaving the land fallow during summer or growing a pasture when some sheep and stock is maintained on the farm. In summer it is not possible to grow any other crop while in winter other grain crops like oats and barley can be grown; however, these crops have no market unless they are grown as fodder for the farm livestock.

Australian wheat lands are fortunately free from the menace of noxious weeds or ravages of insect and bird pests, but wheat rust is a dreaded fungus disease in certain parts of the wheat belt. Australia is literally overrun by rabbits. The rabbit is considered to be the greatest enemy of Australian prosperity and economy. It is a universal curse of grass-lands and pastures. Without the rabbit Australia could carry 25 per cent. more stock. While travelling through the countryside or walking on the farms I came across many of them, squatting on their hind legs along the roadside or on the farm track, eternally munching at the green brown feed of the golden fleece. The Australian farmer spends a considerable effort and fortune to eradicate his enemy. Heinrich farm had a special plough to dig deep in the rabbit warren while on another farm I saw the farmer commission a bulldozer to completely demolish and destroy the warrens which run deep and in many directions.

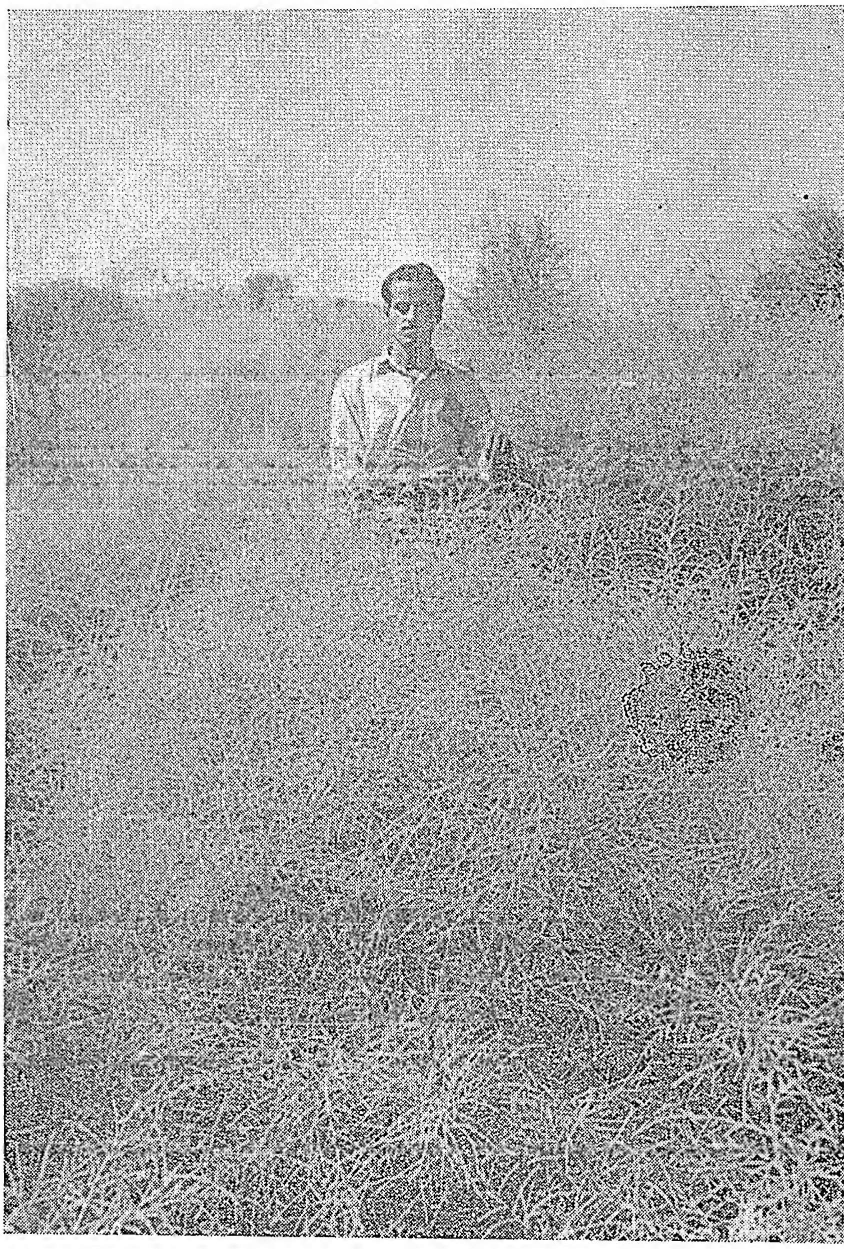
LIFE OF THE FARMER

Every wheat farmer invariably lives on his property; consequently, he has to live at a considerable distance from a sizeable country town. The further he stays from the town, the less he and his family can avail themselves of health, education, trading, cultural and other community services. Holt in his sociological survey of wheat farms in Victoria observed that the most frequent size of a property was 960 acres, and half the farmers were more than three miles from an all-weather road, 13 miles from the doctor, 13 miles from a bank, 53 miles from a store selling furniture, some children were travelling as far as 96 miles a day to and from a post-primary school, while others were excluded because of the distance or cost of board.

Water supply for domestic purposes and livestock is a hard problem; Heinrich farm had its water brought from a distance of 40 miles. Some farms which were not so fortunately located had underground cement tanks which were filled with run-off water from the sloping galvanized iron roofs of the farmstead during the rainy season and water pumped for consumption. All the farms visited by me had running water and some of them had hot and cold water service. Water for the stock is collected in tanks and dams during the rainy season and used all the year round. Most of the farmers had their own electric plants operated either by an engine or a wind-mill. Most of them had many modern conveniences in their homes such as refrigeration unit, vacuum cleaner, electric iron, telephone, wireless set and the car.

Isolation from the neighbours and a solitary life are the stock-in-trade of a farmer. Nearest neighbour to the Heinrich family was 2½ miles away while some wheat farmers I visited had no other family living within a distance of five miles. Their contacts with the outside world are through telephone, wireless and car. "Going to town" is a big occasion for all of them. If his child can travel 96 miles a day to a school it is no wonder if the farmer and his family do 150 or even 200 miles a day to attend a race meeting or a 'footie' or a 'cricket' match. I had an opportunity to do 200 miles to attend a race meeting and 60 miles to attend a party which lasted into the early hours of the morning.

My two days soon passed away in the midst of the roaring tractors and fertile fields and fleecy merinos and inimical rabbits and golden hearted and hospitable farmers and their families who welcomed me to their houses and farms with great warmth. This initial trip gave me a taste for visiting other wheat farming districts, but wherever I went the basic pattern of wheat production was the same.



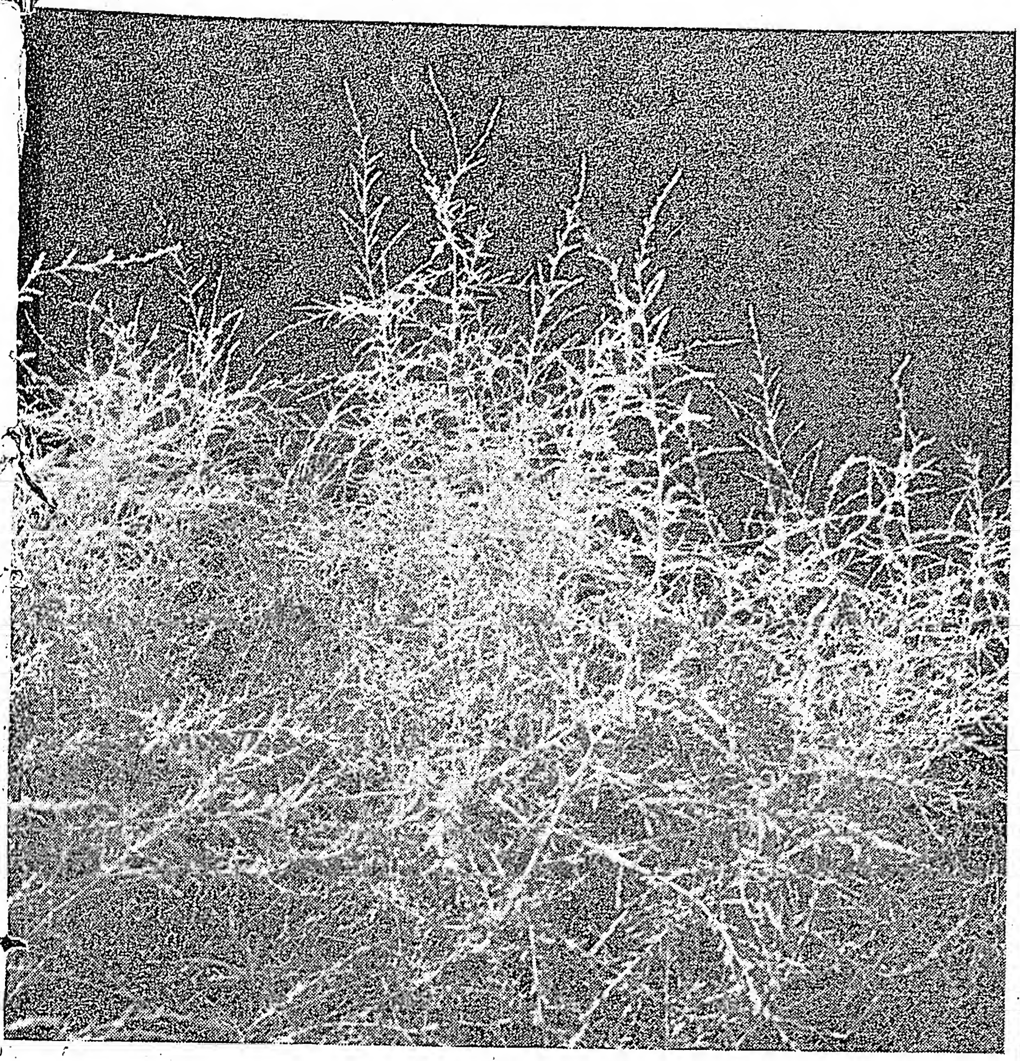
Bushy growth of miracle plant near Delhi

Miracle Plant

By
D. CHATTERJEE
Indian Agricultural Research Institute, New Delhi

MOVEMENT of plants from one country to another has been going on for several centuries. Those which give us food and those which are sources of medicine, rubber, beverages, ornamental plants and fibre plants are intentionally transported by man, while others like some of the troublesome weeds, such as the water-hyacinth, the *Lantana* and *Croton sparsiflorus* have reached our country as unintentional introductions. The following account of an unintentional introduction of an Indian plant in Egypt, which has occurred in recent years, may show how a weed can be of immense value and prove useful in another country.

This plant which is called by various names, such as the miracle plant, the devil's plant or the German grass is commonly found near Delhi where it is locally called *bui*. The plant is an annual weed and is found during the months of July to November. It is closely related to another common weed called *bathua* or *bathu* (*Chenopodium album*), but the *bui* has a quicker growth and has a more bushy habit. Its seeds are very light and very minute. During the World War II, it is well known that large scale transport of troops took place between India and North Africa and some of the seeds of *bui* may have been accidentally transported from Delhi to the deserts of Egypt. They may have found their way either by sticking to gunny bags of air cargoes or by being carried in the folds of trousers of military personnel. This was possible, because the *bui* plant is common near the aerodromes of Delhi. The seeds germinated in the western deserts and contrary to expectations gave rise to clumps of green vegetation in those desolate and arid regions. Their appearance was first noticed at a time when Montgomery's forces were breaking up the German army after the battle of El Alamein. Because the German army was there, the introduction of this plant was wrongly associated with them and the plant was given the name German grass. But a few years later, clumps of this plant were again noticed near Alexandria when it attracted the attention of the Egyptian scientists. According to reports published in the newspapers, Dr. Hilal Kassem of the Egyptian Ministry of Agriculture, at first thought that the plant could have come from Australia or New Zealand and least of all from Germany. Soon after this, Professor D. Thoday, F.R.S., of Farouk University, Alexandria, after some investigation came to the conclusion that the mircle plant of Egypt is a native of India and botanically known a

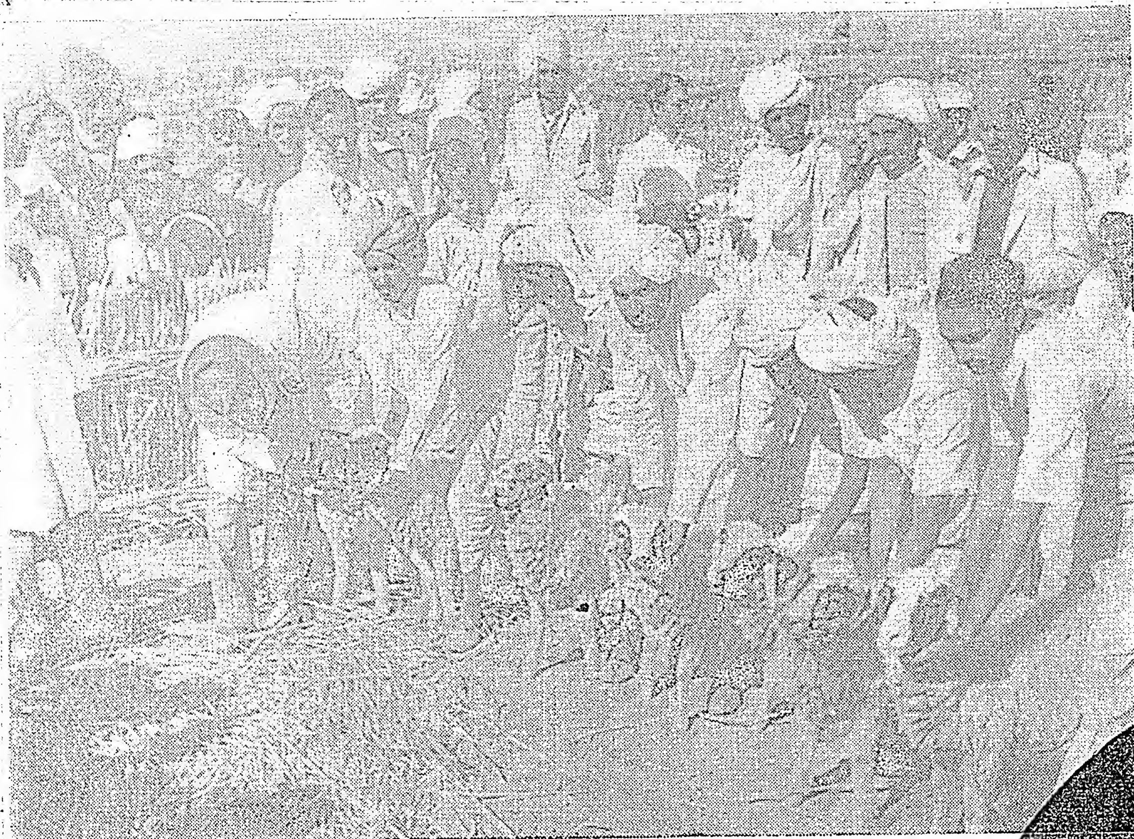


An individual plant

Kochia indica. For a final confirmation of his findings, specimens of this plant growing near Delhi were specially collected and sent by the Indian Agricultural Research Institute, New Delhi and both the Egyptian and Delhi specimens were found to be identical.

The vigour with which the miracle plant grows and its uses in desert areas as food and fuel soon attracted the attention of neighbouring areas of Jordan. The plant is very much liked by camels, cattle and mules and the dry plants are used as fuel. The Government of Jordan became anxious to secure seeds of this plant and recently some seeds were sent from the Indian Agricultural Research Institute, New Delhi.

From the available records it appears that this plant has a very restricted distribution around Delhi and Coimbatore, and so far there is no record of its occurrence in the arid zone of Rajasthan. In view of the fact that the Libyan and the Rajputana deserts fall within 20° to 30° N. latitudes, it is possible that these two areas have the same types of micro-climate. Therefore it is likely that growing the *bui* plant in Rajasthan may meet with the same degree of success as in the African desert. Experiments regarding its degree of spread, regeneration, viability of seeds, dispersal of seeds and its usefulness against soil erosion would be necessary. Some preliminary observations were made in a waste plot of land near the Indian Agricultural Research Institute, New Delhi and it was found that the natural regeneration was good and the spread of the plant has been also remarkably good. The growth was observed for three years.



Ram judging

Heavy-weight champion

POPULARISING BIKANERI BREED

By

SUNANDA NARAYAN

IN the production of quality wool foreign countries lead. It is, however, not generally realised that India is well known for its production of carpet type wool. The source of this wool is the Bikaneri breed of sheep. The Bikaneri breed, the best wool producing breed of India, is also known as Shekhawati or Chokla in Rajasthan from where it originally came. There are 15 lakhs of this type of sheep spread over Churu, Sikar and Jhunjhunu districts in Rajasthan.

It is necessary to mention here that Rajasthan is the leading wool producing State in India. Possessing about one-fifth of the total sheep population this State has to its credit about one-third of the total production of wool in this country.

Realising the important role played by sheep rearing and wool production in the economy of the State, the Government of Rajasthan has recently sanctioned the establishment of a department for research and developmental work in this field.

The State Government holds annually sheep and wool exhibitions in the areas which are predominantly concerned with sheep rearing. Such exhibitions stimulate the interest of sheep farmers in further improve-

The first three prize winners under ram class

ment of their stock and production of quality wool. Because of its importance much attention is necessarily bestowed on the Bikaneri breed in these exhibitions to make them popular among the interested people.

In Jhunjhunu the first show was held in 1950 and the second at Sikar in 1951. The third show in the series was held from 26 to 28 December in 1952 at Jairampura, a village in Sikar district under the name Shekhawati Sheep and Wool Exhibition; it was a great success as was evinced by the fact that nearly 15,000 people visited the exhibition.

During this exhibition sports and competitions were held to arouse interest in people. In the evenings instructive lectures were delivered by officers on different aspects of sheep farming and wool production. Films on sheep farming and different subjects relating to agriculture, Red Cross, health, cooperation, etc. were shown to the visitors who were highly impressed by what they saw.

Prizes were distributed on the last day of the exhibition. The farmers of the area, however, had turned up with their flocks as they were inexperienced and did not know the technique of picking the best out of the lot. The extension staff of the Sheep and Wool Improvement Department, therefore, had to help them to sort out the best sheep from the flocks, classify the selected ones according to breed, age, sex, etc. so as to place them in pens allotted to each class. The different classes were: (*i*) lambs and rams 4-6 toothed, 2-4 toothed; (*ii*) lambs and ewes 4-6 toothed, 2-4 toothed; (*iii*) best flock; and (*iv*) best sheep in the show.

The third exhibition helped in popularizing the Bikaneri breed among sheep farmers and stressing the possibilities of its improvement.

HOW TO APPLY FERTILIZERS

By **P. C. RAHEJA** and **H. S. DHILLON,**
Division of Agronomy, Indian Agricultural Research Institute, New Delhi

IS it not a common complaint that fertilizers burn the crops? Are these not often toxic in their effect on crops ? Do the cultivators not complain that their soils have become sour ? Have other farmers not complained that for obtaining equally good response more and more fertilizers are required as time elapses ? Still others talk of deterioration in quality of grain and fruit in crops, vegetables and fruits. Some are afraid of excessive vegetative growth, lodging and higher incidence of diseases and pests. All and several of these fears are expressed by farmers still not used to the efficient application of fertilizers. Cultivators who have applied these fertilizers for a decade or more and understand their correct usage are becoming more fertilizer-minded. Unlike other manures, the fertilizers are concentrated manures and, therefore, require careful application to the field

FERTILIZERS' SUITABILITY TO SOIL

The fertilizers in most common use in India are ammonium sulphate and sodium nitrate to supply nitrogen to crops; superphosphate to fertilize for phosphorus deficiency; ammophos to meet nitrogen and phosphorus requirement of soil and potassium sulphate to recoup potash deficiency in the soil. The same fertilizer is not beneficial in equal degree on all types of soils. Most soils in India have high lime content and are alkaline in nature. Application of ammonium sulphate to such soils pays to produce most of the crops. It leaves no ill effect in the soil for the succeeding crop. In localized sour soil areas of Assam, West Bengal, Orissa and Madras States the respose to ammonium sulphate is, however, poor. Other fertilizers of similar acidic nature are niciphos, ammophos, ammonium nitrate, urea, superphosphate and potassium sulplate. In sour acidic soils the suitable fertilizers for use are sodium nitrate, ammonium chloride, calcium nitrate and basic slag.

NUTRIENT STATUS OF SOILS

Nitrogen deficiency in most of the Indian soils is very acute. Low yields of crops are chiefly due to lack of nitrogen. Response to nitrogenous manuring has, more or less, been realized in all parts of the country. The supply of farmyard manure is quite inadequate to push up the yields. Besides the inadequacy of farmyard manure, it is slow acting in its nature. Throughout the life cycle of the crop hardly 40 to 50 per cent of its nitrogen is released for the use of the crop. The natural powers of nitrogen recuperation of soils are low because of general lack of organic matter, which has a distinct relationship to nitrogen in the soil. Therefore, to meet this acute deficiency of nitrogen, ammonium sulphate, sodium nitrate or ammophos are brought into use to augment yields of food, vegetable and commercial crops.

The deficiency of phosphate is less acute and less widespread. Maximum deficiency exists in North Bihar, moderate in the alluvial tracts of the Punjab, Uttar Pradesh, Madhya Pradesh, South Bihar, West Bengal, Assam and Orissa and lesser deficiency in the coastal plains of Bombay and Madras States and the plateau region of Hyderabad, Mysore and Malabar Coast. Therefore, phosphatic fertilizers are less in demand. The application of farmyard manure meets the deficiency to a very limited extent. The release of native phosphate takes place at a very low rate in the absence of organic matter in sufficient quantity. The deficiency of phosphorus has, therefore, to be covered by addition of phosphatic fertilizers.

Another nutrient which in some localized areas limits realization of high yields is potash in the soil. These parts consist of a large tract in Assam, southern Orissa, Chota Nagpur in Bihar, Nilgiri Hills area in Madras State. Its deficiency is less acute and response to potassic fertilizers, independent of nitrogen and phosphatic manures, has not been observed. Therefore, wherever the deficiency of potassium exists application of potassium sulphate makes up the deficiency in conjunction with nitrogen and phosphatic fertilizers.

Some other elements found deficient are boron, molybdenum, copper, zinc, iron and manganese. These are required in traces by most of the crops and show characteristic symptoms in indicator plants, in very localized areas. Their deficiency can be met by the application of fertilizers to the soil or spraying on the plants.

ESSENTIAL CONDITIONS FOR SUCCESSFUL RESPONSE TO FERTILIZERS

Nitrogen in the soil is usually free to be readily taken up by the crop. It is also easily leached down with the drainage water into the sub-soil beyond the range of root zone. The greater the amount of nitrogen present in the soil the larger is the response in the yield of the crop. Undecomposed organic matter in the soil locks up nitrogen. When sufficient amount of decomposed organic matter is present the loss of nitrogen by leaching, and escaping as gas is prevented. Therefore, for keeping up the high nitrogen content in the soil to obtain high crop yields, the farmer should apply adequate quantity of organic manures. In other words, constant use of nitrogenous fertilizers without the application of farmyard manure, green manure or city compost reduces their response in maintaining high crop yields.

In sandy soils which have high porosity, nitrogen of the fertilizer leaches out rapidly beyond the active absorbing root system of the crop. Therefore, farmers should apply fertilizers to sandy and gravelly soils in small doses at short intervals and not in a large dose at one time.

When phosphatic fertilizers are applied to the soil, they chemically combine with the soil and their phosphorus becomes bound up with the soil particles and is, therefore, less readily available for plant use. The

lesser the contact of the fertilizer with the soil greater is the response shown by the crops. Therefore, these fertilizers are applied or placed in a band below the seed or to the side of the seed and the system is known as "placement." When adequate quantity of decomposed organic matter is present in the soil the phosphate of the fertilizer readily combines with it rather than with the soil. This organic matter on further decomposition gives up phosphorus for crop use.

IMPROVED PRACTICES OF APPLICATION

Most farmers apply fertilizers by broadcasting in the field. This way the response to nitrogen decreases and the phosphate of the fertilizer becomes less readily available for plant use when it comes in contact with a large mass of soil. Drilling the fertilizer with the seed, particularly in the cereals, is common in foreign countries. Drilling and seeding operations are carried out by combined seed and fertilizer drills. Now placement machines have been evolved and are in use. A similar but simpler placement machine has been described in a recent issue of the *Indian Farming*. But most cultivators have not yet taken up the use of horse-hoe. They use their Desi plough for most operations. The farmer is able to adjust the depth of the furrow by adjustment of the beam in relation to the yoke. An experiment on fertilizer placement by Desi plough was conducted at the Indian Agricultural Research Institute, New Delhi, with the following results ;—

YIELD OF MAIZE CROP—
(IN ACRES)
Methods of placement

Treatments		I Year				II Year			
Ammonium sulphate	Superphosphate	Broadcast	Placed below seed line $2\frac{1}{2}$ ins. deep	Placed below seed line $4\frac{1}{2}$ ins. deep	Mean	Broadcast	Placed below seed line $2\frac{1}{2}$ ins. deep	Placed below seed line $4\frac{1}{2}$ ins. deep	Mean
100 lb.	100 lb.	15.5	16.4	15.1	15.7	11.3	14.5	14.2	13.3
150 lb.	100 lb.	15.9	17.5	17.5	17.0	12.7	15.4	9.4	12.5
300 lb.	100 lb.	16.0	18.5	18.7	17.7	18.1	12.4	18.0	16.2
Mean		15.8	17.5	17.1		14.0	14.1	13.9	
100 lb.	150 lb.	15.4	17.5	17.2	16.7	11.3	17.4	10.9	13.2
150 lb.	150 lb.	17.2	19.5	18.6	18.4	14.2	11.7	14.6	13.5
300 lb.	150 lb.	20.2	20.8	19.9	20.3	12.6	19.9	13.3	15.3
Mean		17.6	19.3	18.6		12.7	16.3	12.9	
100 lb.	300 lb.	15.6	16.1	17.4	16.4	12.7	11.6	12.5	12.3
150 lb.	300 lb.	18.4	20.2	19.3	19.3	12.2	12.5	13.6	12.8
300 lb.	300 lb.	19.9	22.8	21.8	21.5	13.6	22.3	18.3	18.1
Mean		18.0	19.7	19.5		12.8	15.5	14.8	
Overall Mean		17.1	18.8	18.4		13.2	15.3	13.9	

Placement of fertilizers at $2\frac{1}{2}$ ins. below the seed, gave definitely higher yield than broadcast application. Placement at $4\frac{1}{2}$ ins. below the seed was less advantageous.

A preliminary trial conducted with peas showed that $4\frac{1}{2}$ ins. depth of placement from ground level and roughly $2\frac{1}{2}$ ins. below the seed but in a side band gave extra yield of about $1\frac{1}{2}$ to 2 md. per acre with a dose of 100 to 125 lb. triple superphosphate. This placement was carried out by a fertilizer placement machine.

For berseem fertilizers were placed in the same manner at 2 to 3 ins. below the seed and seed broadcast in the lap of the furrow. Immediately irrigation was applied. The results were as under :—

YIELD OF BERSEEM FODDER

(IN ACRES).

Placement	Fertilizers applied/acre						
	Control (No Manure)	Triple super @ 200 lb.	Triple super @ 200 lb. ÷ Pot. sulphate @ 150 lb.	Triple super @ 200 lb. ÷ Amm. sulphate @ 200 lb.	Triple super @ 200 lb. ÷ Amm. sulphate @ 200 lb. ÷ Pot. sulphate @ 150 lb.	Mean yield for placement treatments	Percentage increase on control
A—Broadcast (Control)	352	441	417	443	510	433	—
B—Placed in furrows 6 ins. apart	361	440	493	498	573	473	9.4
C—Placed in furrows 12 ins. apart	343	470	480	468	521	456	5.4
Mean yield for fertilizers	352	450	464	470	535	—	—
Percentage increase on control	—	27.8	31.8	33.5	52.2	—	—

Besides, the very large increases in yield by fertilization of berseem crop the placement of fertilizers in furrows 6 ins. apart resulted in 40 md. or 9.4 per cent increase of fodder yield over control. Similar results with wheat have been obtained at the Agricultural School Farm, Buland Shahr. The extra response obtained by placing at $2\frac{1}{2}$ ins. was 1.5 md. of wheat yield per acre. In sandy soils where nitrogen fertilizer is to be applied in small quantities, after the first dose has been drilled with seed, second application should be given, with the first irrigation. The fertilizer should be mixed with five parts of soil and broadcast. Immediately after broadcasting, irrigation should be applied. In dry wheat, unless the soil moisture is inadequate, drilling ammonium sulphate with seed has given good response all the world over.

Side band placement is practised for such crops as potatoes, cotton, tobacco, chillies, cabbage and other vegetables two weeks after transplanting or germination of seedlings. It is preferable to irrigate the land immediately after side band placement of fertilizer. The side band should be about 3 to 4 ins. away from the row of plants and $2\frac{1}{2}$ ins. deep. If the dose of fertilizer is heavy and the crop is sensitive to the fertilizer, e.g. tobacco, the space between the seedling and fertilizer is increased. The side band placement can be conveniently done with a hand plough with furrower attachment.

In sugarcane usually a top dressing of 100 lb. of nitrogen equivalent of 500 lb. of ammonium sulphate is applied as a top dressing. This dressing is usually placed in the furrow which is mixed up with furrow soil and sett placed over it. When it is applied as top dressing then the fertilizer is doled out in hoes made with a peg and a hammer. Measured quantity of the fertilizer is poured into the hole with the scoop. Then holes are made in between the plants.

PRECAUTIONS

Several precautions are essential in the application of fertilizers :

1. The fertilizers will show response when the nutrients are deficient in the soil.

2. Large doses of artificial nitrogenous fertilizers should not be applied to sandy and gravelly soils.

3. There should be adequate moisture in the soil to keep low concentration of these nutrients in the soil solution. Otherwise these may prove toxic to plants.

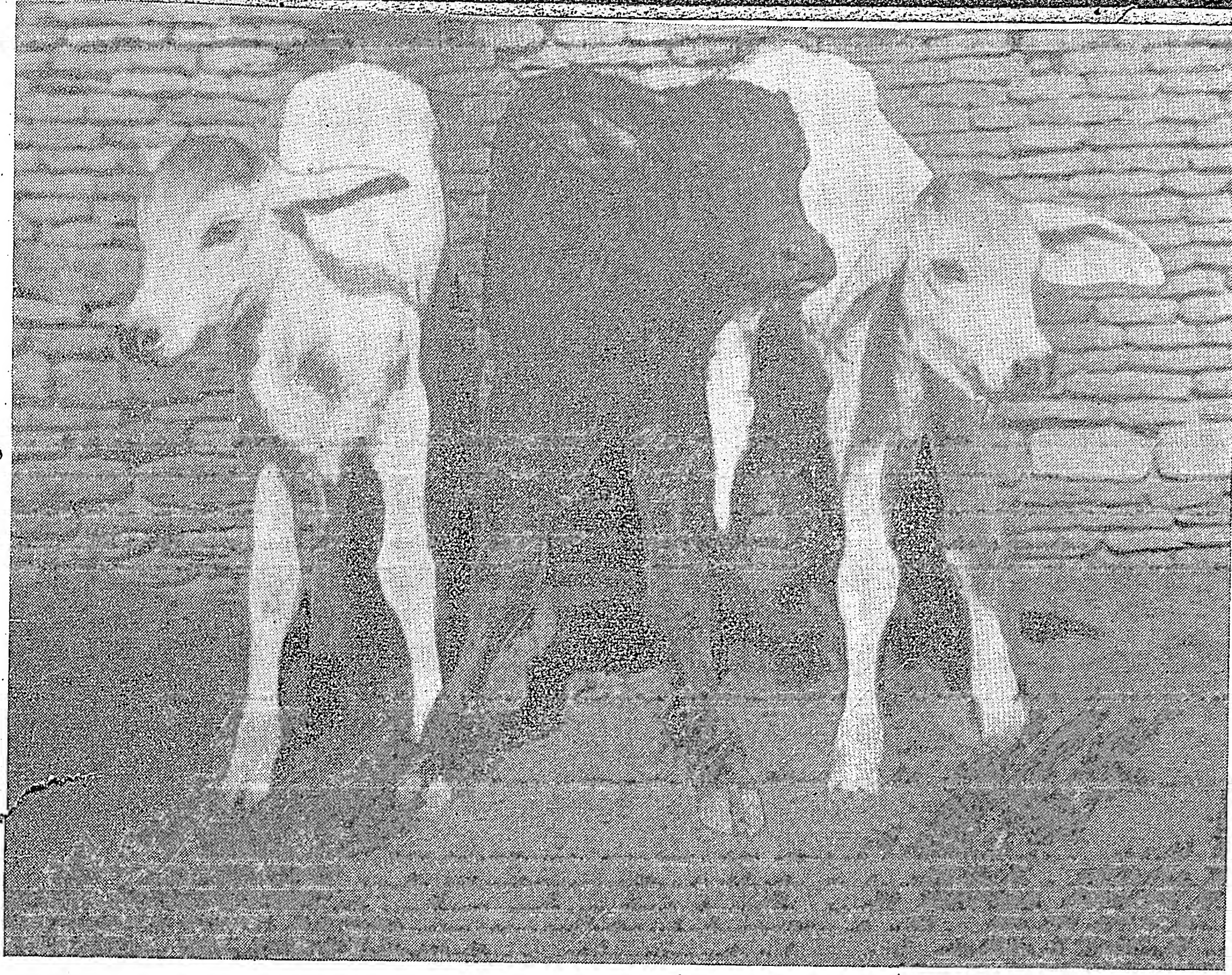
4. There should be sufficient organic matter in the soil so that nitrogen from the fertilizer should not escape away as gas or phosphate of the fertilizer be chemically combined or "fixed up".

5. Phosphatic fertilizer should be placed in a suitable manner in all row crops. In crops such as berseem, *methra*, senji, etc. it should be mixed with soil by harrowing before seed is sown.

6. Before nitrogenous fertilizer is broadcast as top dressing in the standing crops it should be mixed with five parts of soil or F.Y.M. to dilute the manure. Otherwise it burns the leaves.

7. Top dressing of nitrogenous fertilizers should preferably be done after three to four weeks of the germination of the crop or establishment of transplanted nursery.

8. For green manure crops the phosphatic fertilizers should be applied just before seed is sown in the soil.



First batch of test-tube calves at Government Live-stock Farm, Hissar

ARTIFICIAL INSEMINATION OF CATTLE IN THE PUNJAB

By

M. L. KOHLI, R. M. SHARMA and K. R. GHULATI,

Government Livestock Farm, Hissar

THE condition of cattle in this country can be improved by scientific methods of breeding, feeding and protection against diseases and proper care and management. Breeding invests the animals with a certain amount of inherited capacity to produce ; feeding, disease control and management enable the animals to manifest that inherited capacity in actual production. Any amount of feeding or disease control alone would not make the animals produce more than what has been pre-determined by heredity. The first essential, therefore, is to locate the animals possessing potentialities for production of a very high order and utilize them in a well planned and systematic manner so that their kind may be progressively multiplied. At present about 750 good pedigree bulls are produced every year in various cattle breeding farms of India as against the estimated demand of about one million. This deficiency can, however, be made up by making use of the modern technique of artificial insemination.

ARTIFICIAL INSEMINATION

It is a method of propagation that consists in the introduction of semen into the genital passage of the female by means of an instrument rather than by natural mating. It is conducted in accordance with thoroughly well established physiological principles and when properly

performed has nothing in the process which may be harmful to either the male or the female. The calves born by this method are as healthy and vigorous as those produced by natural matings by the same bull and have the same genetic make-up.

Many consider artificial insemination to be an unfortunate term because it involves an unnatural method. In fact, it is no more unnatural than the planting of seed grain with a drill. Truly speaking, it is a method of selective breeding. By artificial insemination, there is an ample scope of improving our livestock by making the widest possible use of the most carefully selected males. Among many advantages of this technique over natural mating, the principal one is that whereas a good fertile bull can give natural service to about 100 cows a year, the same bull when used through artificial insemination can safely settle 1000-4000 cows during that period. Recent developments in this field have led to the discovery of suitable media to preserve the potency of the semen for several days. This achievement is of great practical importance to the farmers as it helps them overcome the difficulty experienced in the villages of searching a good sire for the cow when she is in heat. The farmer can now easily take advantage of the free services of the nearest artificial insemination centre where semen from tested potent sires is always available for use.

POPULARITY OF THE TECHNIQUE

This method of artificial insemination has been adopted by all progressive nations for improving livestock. In India the first attempt on a very small scale was made in 1939 but well planned experiments started in 1942 at the Indian Veterinary Research Institute, Izatnagar. In 1944, this work was extended to the neighbouring villages of Izatnagar. From 1945-47 four more centre (Bangalore, Calcutta, Patna and Montgomery) were opened to investigate the environmental effects, if any, on the practical application of artificial insemination on a large scale. This method has since been incorporated in the animal breeding plans of almost all the States of the country.

SCOPE IN THE PUNJAB

According to the livestock census of 1951 in the Punjab State, there is a population of about 12,12,411 cows and 13,67,266 buffaloes of over three years of age which are considered to be fit for breeding purposes. On the basis of one bull required for 100 cows per year, the total number of approved bulls desired for the purpose should be 12,124 cow-bulls and 13,672 buffalo-bulls. But there are at present only 5,180 cow-bulls and 9,844 buffalo-bulls at work in the State. Evidently there is a shortage of 6,944 cow-bulls and 3,928 buffalo-bulls. Thus the main problem facing the State is to explore the most effective means to make the best use of the limited number of available superior sires. The only feasible plan is to make the best use of the latest biological technique of artificial insemination by establishing a network of artificial insemination centres in the State. The cows in those particular areas should have no access to any scrub or unapproved bull, otherwise the improvement produced in one generation is likely to be nullified in the next generation. Consequently, artificial insemination will prove an asset to the farmer in building up large herds of improved stock within a relatively short period.

In the Punjab, a Key Farm Centre was started at Government Livestock Farm, Hissar, in December, 1951. This Centre has recently been merged into the Key Village Scheme. Twelve contiguous villages with a population of 1,000 cows and buffaloes within a radius of five miles of the Centre were selected out of which four have been converted into Key Villages. Five cow-bulls and five buffalo-bulls with known pedigree records and good conformation are being maintained at the Centre. High quality semen collected from these bulls is diluted, suitably preserved and despatched to the villages through stockmen for insemination purposes. The staff, in addition, keeps a vigilant watch in controlling the spread of any contagious disease, carries out castration of all scrub bulls and maintains proper production records of the milch animals in the selected area. Steps have been taken to open two more such centres. Besides, an artificial insemination centre is functioning at the Government Cattle Breeding-Cum-Dairy Farm at Karnal under the control of the Central Government.

RESULTS ACHIEVED

Investigations and trials conducted under conditions obtaining in India have proved that artificial insemination centres are quite successful and the initial prejudices of the farmers can be soon shaken off. There is undoubtedly a promising future for such centres in the country as is evident from the work already done at the Indian Veterinary Research Institute, Izatnagar and its sub-stations. A total of 25,964 cattle, buffaloes, sheep and goats were inseminated at these regional centres upto the end of March, 1950. At the Izatnagar centre alone, 1,000 animals on an average are being inseminated annually. The overall pregnancy rate was 60-75 per cent. This is decidedly better than could be expected from natural matings.

During the short period of 10 months, the centre at Hissar inseminated 476 cattle. That the method is finding favour with livestock-breeders is evident from the increase in the number of inseminations performed from month to month. In order to achieve the desired results and to avoid promiscuous breeding, 13 scrub bulls have been castrated or removed from the area attached to this centre. The Municipal Committee, Hissar, realising the importance of this measure have framed a bye-law enforcing compulsory castration of all scrub bulls in the municipal limits of the town.

INDIAN FARMING

Vol. III **New Series No. 3** **June 1953**

EDITOR'S PAGE AND EDITORIAL NOTES 2
MAN OF THE MONTH (Feature Article)—N. R. Ramaiya 4
CHILO ZONELLUS SWINH. AND HIEROGLYPHUS NIGROREPLETUS BOL.—E. S. Narayanan 8
TOMATOES IN METROPOLIS—H. B. Singh 10
STORY OF A GRASS IN ASSAM—D. L. Paul 12
KING MANGO—Rampa Pal 14
SEWARGAON-DUKRE, THE VILLAGE WITH A PURPOSE—A. R. Vyas. 16
SUGARCANE AND OATS SILAGE—Yashpal Chandra Gupta 18
WHY PRACTISE MIXED FARMING?—P. C. Raheja and S. R. Obhrai .. 20
GINGER CULTIVATION IN MALABAR—A. Abdul Samad 22
SESBANIA AS GREEN MANURE—S. R. Balasubramanyan 24
SUDAN GRASS—A New Forage—H. C. Malik 26

EDITORIAL BOARD

PRINTED AND PUBLISHED BY P. H. RAMAN AT THE ASSOCIATED ADVERTISERS AND PRINTERS LTD., 505, ARTHUR ROAD, TARDEO, BOMBAY 7, (AGENTS FOR INDIAN COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI.)

ADVERTISEMENT RATES

CURRENT:
CASUAL

Full Page	Rs. 450/-
1/2 Page	Rs. 225/-
1/3 Page	Rs. 150/-

CONTRACT 6 INSERTIONS	CONCESSIONS: 12 INSERTIONS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

Effective from October 1952 until further notice.

SUBSCRIPTION RATES

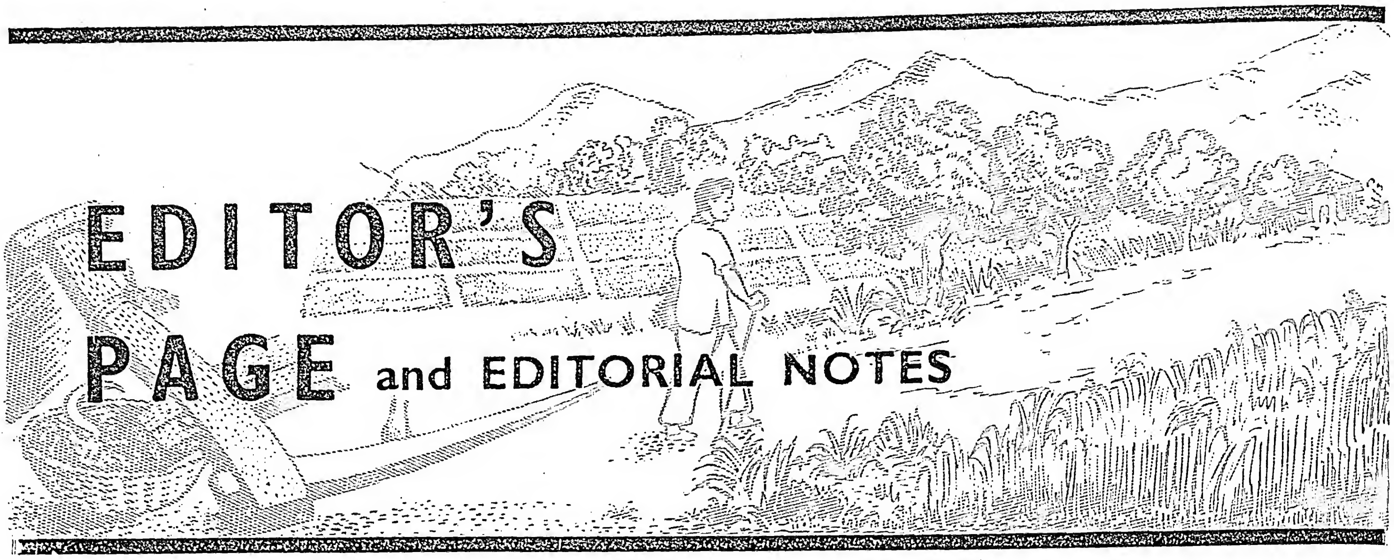
Annas 12 only per copy

Rs. 9-0-0 for 12 issues

Rs. 4-8-0 for 6 issues

★

All Business enquiries may be addressed to the "Agents" at 505, Arthur Road, Tardeo, Bombay 7.



A conference of the principals of the Agricultural Extension Training Centres was convened by the Indian Council of Agricultural Research at Bhopal from 27 to 29 April, 1953. The purpose of this conference was to exchange and evaluate experiences of the past year in training multipurpose village workers.

Besides the principals from the 34 Training Centres, representatives of the Ministry of Food and Agriculture, Community Projects Administration, Technical Cooperation Administration, the Ford Foundation and others attended the meeting.

The success of the conference was due in part to the novel manner in which it was managed. The Chairman split the delegates into seven discussion groups. These groups discussed the various items on the agenda and on the last day came together and unanimously approved recommendations. The delegates agreed that high standards should be maintained for candidates taking training since these candidates not only will be Gram Sewaks but will likely be agents in the permanent National Extension Service now being established. It was agreed that candidates should at least be matriculates or diploma holders from agricultural schools and that agricultural graduates were to be preferred. These men should have a rural background, if possible. It was suggested that standard aptitude tests be developed for these candidates. The basis for selection should be physical fitness of the candidate and his capacity to do things with his own hands before preaching these to others and how far the candidate is animated by a spirit of service to people. The principals recommended that two-thirds of the training work should be practical work in villages helping villages to solve their problems, the remainder of the time to be devoted to classroom discussions and exercise. The content of the training centre, of course, will depend upon the problems the area has in which the future Gram Sewaks will serve. Emphasis will be put on the development of skills in the trainees which could be used in solving village problems. While the course of study was suggested to be 18 months in duration, it was recommended that candidates possessing a diploma from an agricultural school might be trained for six months in basic extension methods. On the recommendations of the delegates to the Bhopal conference each training centre will have a library with a minimum number of suitable books. This library will receive on a regular basis magazines and daily newspapers. The training centre will have such audio-visual equipment as film projectors, radio sets, cameras, blackboards, posters, charts, and duplicators. It will also have a carpenter's shop and a smithy where training can be received in repairs to farm implements and other village equipment. It was also thought that each centre should have a small demonstration farm where practical training could be given in improved farming methods.

A great deal of emphasis was placed on the need for adequate facilities for recreation and cultural development such as gymnasium equipment, volley ball, foot ball, chess, musical instruments and so forth. It was suggested that at each centre the daily routine must begin with a prayer which should inspire the trainees to dedicate themselves to the service of the village people and to feel with confidence that theirs is the most honourable and dignified work in the country. Plays and folk songs were given an important place in the educational programme. These educational activities will relate to village atmosphere and the

rural development work. In addition to this the trainees will participate in important fairs and festivals and help people to participate in these events.

In the end the trainees will be given recognition by being presented with an all India certificate, and it was recommended that the Government of India should also look into the question of a uniform badge for Gram Sewaks.

There was a consensus of opinion among the delegates that graduating a trainee from a training centre was only a beginning of the job. It was extremely important for a training centre to keep track of its trainees' performance in the project areas. The staff of the training centre should periodically visit the areas in which their trainees are working to discuss problems of mutual interest. Following these visits the training programme should be adjusted in the light of the defects in the trainees as discovered by the project officers of the training centre staff. Shorter refresher courses may also be arranged to correct the weaknesses in the village workers' performance in the project areas.

The need for a monthly newsletter in the regional language was pointed out. The delegates agreed that news about the training centre activities, about special problems facing the centre and other problems facing the village in relation to village improvement would be treated in this newsletter. Articles may be contributed by the staff trainees, workers in the project area and farmers. This newsletter will be distributed throughout the training centre area and to other training centres in India.

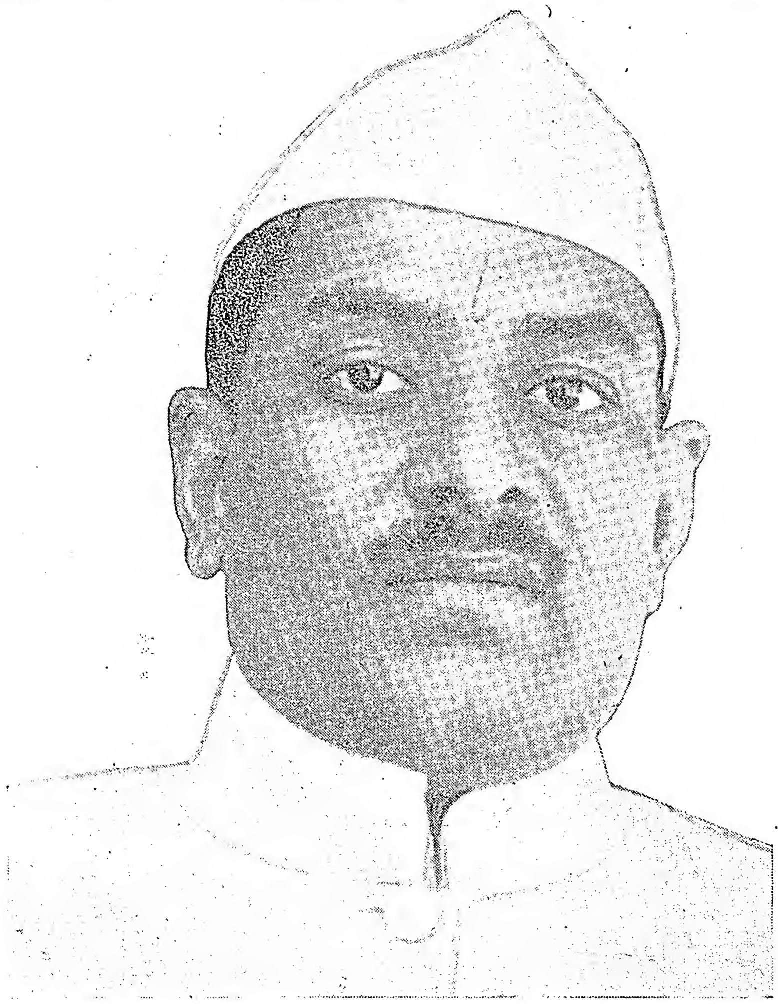
The most encouraging thing noticed at this conference was the sincere enthusiasm of the delegates and their general belief, and the belief of their leaders in the inevitable success of their efforts.

CONTRIBUTORS ARE REQUESTED

to kindly submit two copies of all articles, notes, etc. intended for publication in *Indian Farming.* The articles should be clean-typed in double space on one side of paper, leaving a sufficient margin on the left-hand side. Contributions may be addressed to the Editor, *Indian Farming,* Indian Council of Agricultural Research, Jamnagar House Hutments, Mansingh Road, New Delhi 2.

OUR COVER

Sowing is in progress. An agricultural student is feeding the seed into the seed bowl drill



Fatehchand Dharamchand Mehta of Digras

A SUCCESSFUL CONVERT TO AGRICULTURE

he obtained the highest yield of Jowar in Madhya Pradesh in 1951-52 Season

By **N. R RAMAIYAH,**
Agriculture Department, Madhya Pradesh, Nagpur

ORIGINALLY belonging to a small village near Jodhpur in Marwar and a trader and a money-lender by profession, Fatehchand Dharamchand Mehta of Digras, in Yeotmal district of Madhya Pradesh is one of the outstanding successful converts to agriculture. Having fallen out with the Jagirdar of the village where he was working as a village official, his great grandfather migrated from Jodhpur to this district, where he had a distant relative. Forced by circumstances the Mehtas had to take to agriculture on the lands which came to them by way of mortgage against loans given by them. This successful Marwari farmer has obtained the highest yield of Jowar, 8,000 lb. per acre, as against the average of 1,280 lb. secured by competitors in the State Competition Scheme and the State average of 700 lb. per acre.

Fatehchand was hardly one year old, when he lost his father. His training and education thus passed into the hands of his uncle. His father left him only 50 acres of land. When he was 20, his uncle also passed away leaving young Fatehchand to fight the battle of life single-handed. The responsibility thrust on him at this young age made Fatehchand a man of guts, self-reliant and confident. During these years, by his hard

Fatehchand with Jowar cobs

work and perseverance, he was responsible for raising the area of his farm from 50 to 800 acres, which he now possesses in four villages of this Taluka.

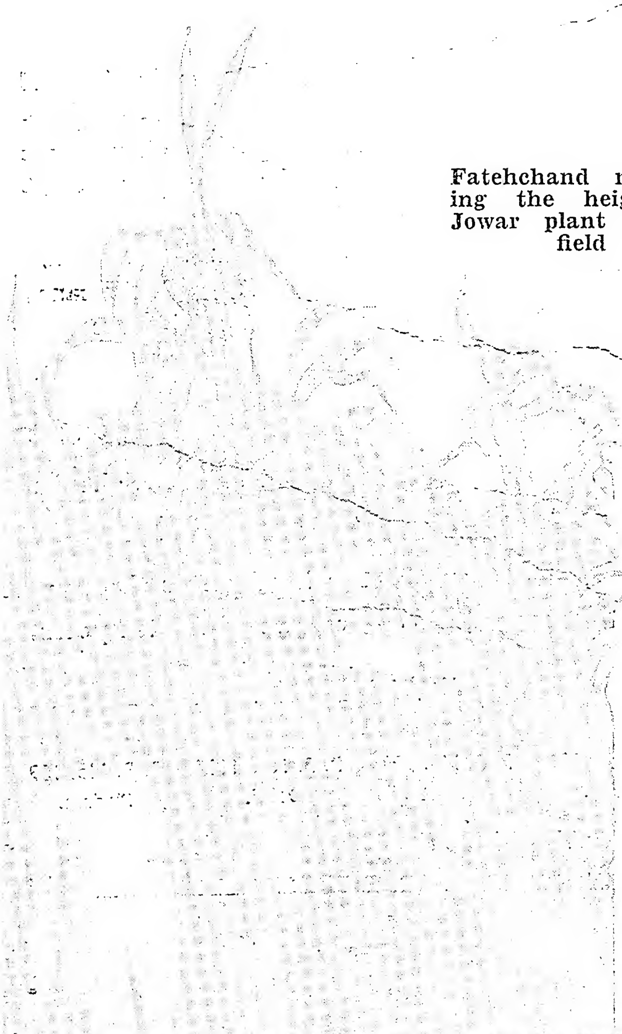
A devout social worker, Fatehchand believes in constant work rather than empty leadership. He owns 25 pairs of bullocks, with which he carries on his agricultural work in an area of 550 acres while the remaining land is cultivated by him in partnership with the small cultivators of his village. The cropping programme of his farm for the year 1951-52 consisted of cotton Buri 0394—70 acres, H420 Cotton—180 acres, *Jowar* Saoner—200 acres, Akola-12-24 groundnut—100 acres, making a total area of 550 acres for his home farm. All these are improved varieties evolved by the Department of Agriculture, Madhya Pradesh. On his farm Fatehchand uses only seeds of improved strains recommended by the State Department.

On 20 acres of this area he grew Jowar crop out of which he entered one acre piece for the crop competition. Besides, he grows sugarcane as well as papayas. To irrigate the area under papayas and sugarcane, he utilises an oil engine, National 8 H.P., for pumping water from a well.

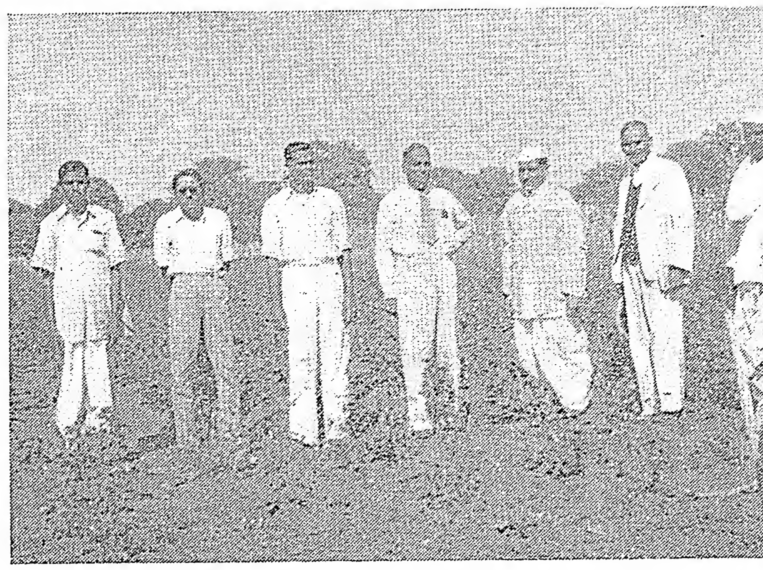
He takes special care to manure his crops amply; he believes in the saying "Feed the Mother Earth that feeds us all." This can be well seen from the fact that he applied 16 tons of oilcake, 2 tons of sulphate of ammonia, besides 35 cartloads of municipal compost to the total cultivated area on his farm.

SOWING AND INTER-CULTURE

The Jowar was sown by him by *Chowfulli* method. According to this method, the rows are 14 inches apart



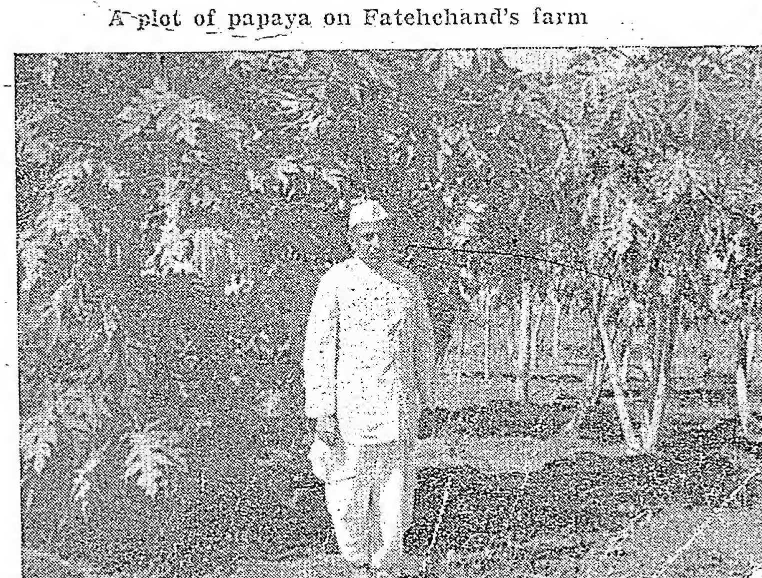
Fatehchand measuring the height of Jowar plant in his field

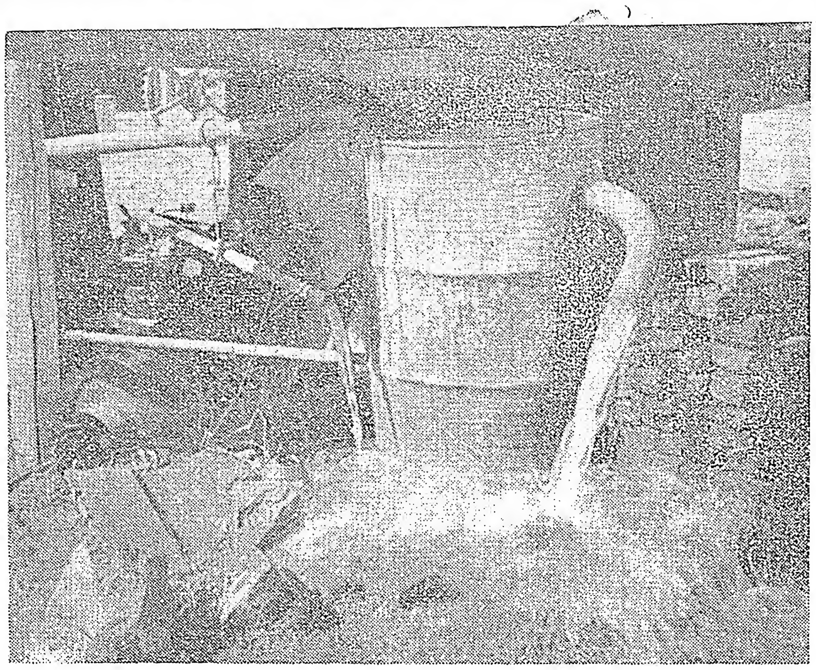


Fatehchand with the officers of agriculture department

Cotton field of Fatehchand

A plot of papaya on Fatehchand's farm





Pumping plant at work on Fatehchand's farm

and the distance from plant to plant is 12 inches. This is done by working two *argadas* (wooden country implements used for sowing purposes) with tynes 14 and 12 inches apart, respectively; one worked lengthwise, and the other crosswise. At every cut two seeds of Jowar were hand dibbled. Inter-cultivation was done in about 35 days after the first weeding and one plant was kept at each place, the other being weeded out.

MANURING

During the summer months, the farm cattle were allowed to sit in the plot and their excretions were ploughed into the fields. In the month of August, this plot was topdressed with oilcake and ammonium sulphate, at the rate of 9578 lb. of oilcake and 2874 lb. of ammonium sulphate, per acre. Twenty cartloads of cowdung manure per acre were applied to the field before sowing. The soil round the plants was 'mulched' by hand and three more hoeings were given.

Fatehchand is full of spirit and enthusiasm and is not satisfied with what he has already achieved. He wants to raise a still higher crop of Jowar, etc. on his farm. He makes a net profit of about Rs. 25,000 per year from his farm. This amount is quite sufficient to provide him all the necessities of life and reasonable comforts as also money for improving his farm.

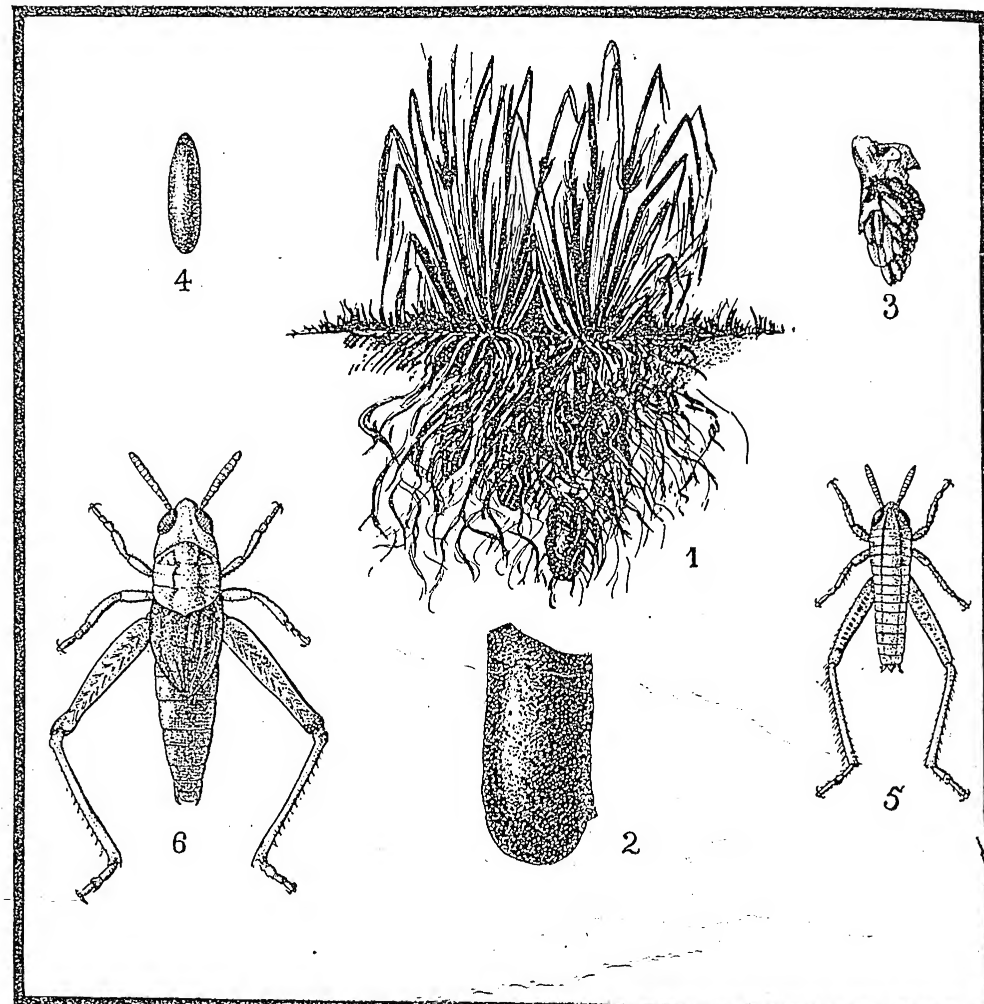
He is also interested in improving the cattle on his farm and is running a 'Key Village Centre' at Sawanga. He has recently brought one Nagod bull from Marwar for improving his cattle stock and that of his neighbouring villagers.

ers
nder-
or three
are oval in
reamy white in

SEASONAL PESTS OF CROPS: CHILO ZONELLUS NIGROREPLETUS

By
E. S. NARAYANAN
Head of the Division of Entomology,
Indian Agricultural Research
Institute, New Delhi

NEXT only in importance to wheat and rice, kings among plants, maize and *jowar* are the two other cereals that play a vital role in the economy of rural India. Maize is a nourishing food par excellence. It is extensively grown more or less in a continuous belt from Punjab in the north to Bihar in the east. Jowar, rightly known as the poor man's food, is grown in extensive areas in the Punjab and Uttar Pradesh in the north, Bombay in the west, and Deccan, Madhya Pradesh, Berar and Madras in the south. Indeed the area under *jowar* is more than three times than that under maize. Both maize and *jowar* are also grown as fodder crops for cattle on account of their luxuriant succulent vegetative growth. Although a number of insect pests have been recorded on both *jowar* and maize, two of the most destructive pests common to both are the stem borer, *Chilo zonellus* and the grasshopper, *Hieroglyphus nigrorepletus*, commonly known as Phadka. Both the pests c[illegible]age to the crops from the nursery right upto the entire period of the plant growth. Sometimes the depredations by these pests are so severe in the seedling stage that resowing becomes a necessity. While the stem borer, *Chilo zonellus* has been observed to be a serious pest in all the States of the Indian Union where *jowar* and maize are grown the activity of the grasshopper Phadka is localized to well defined regions of which Ajmer-Merwara is the most important. Today when our country is faced with an acute shortage of cereal food, and the conservation of the national resources of food has become the most urgent need of the hour the necessity of reducing the damage caused by these pests to the minimum needs no emphasis. Let us now discuss these two pests in some detail.



HIEROGLYPHUS NIGROREPLETUS BOL

1. Egg-pods under the soil near the roots of grasses
2. An egg pod magnified
3. A number of eggs within the egg pod
4. A single egg magnified
5. A freshly hatched hopper
6. The full grown hopper

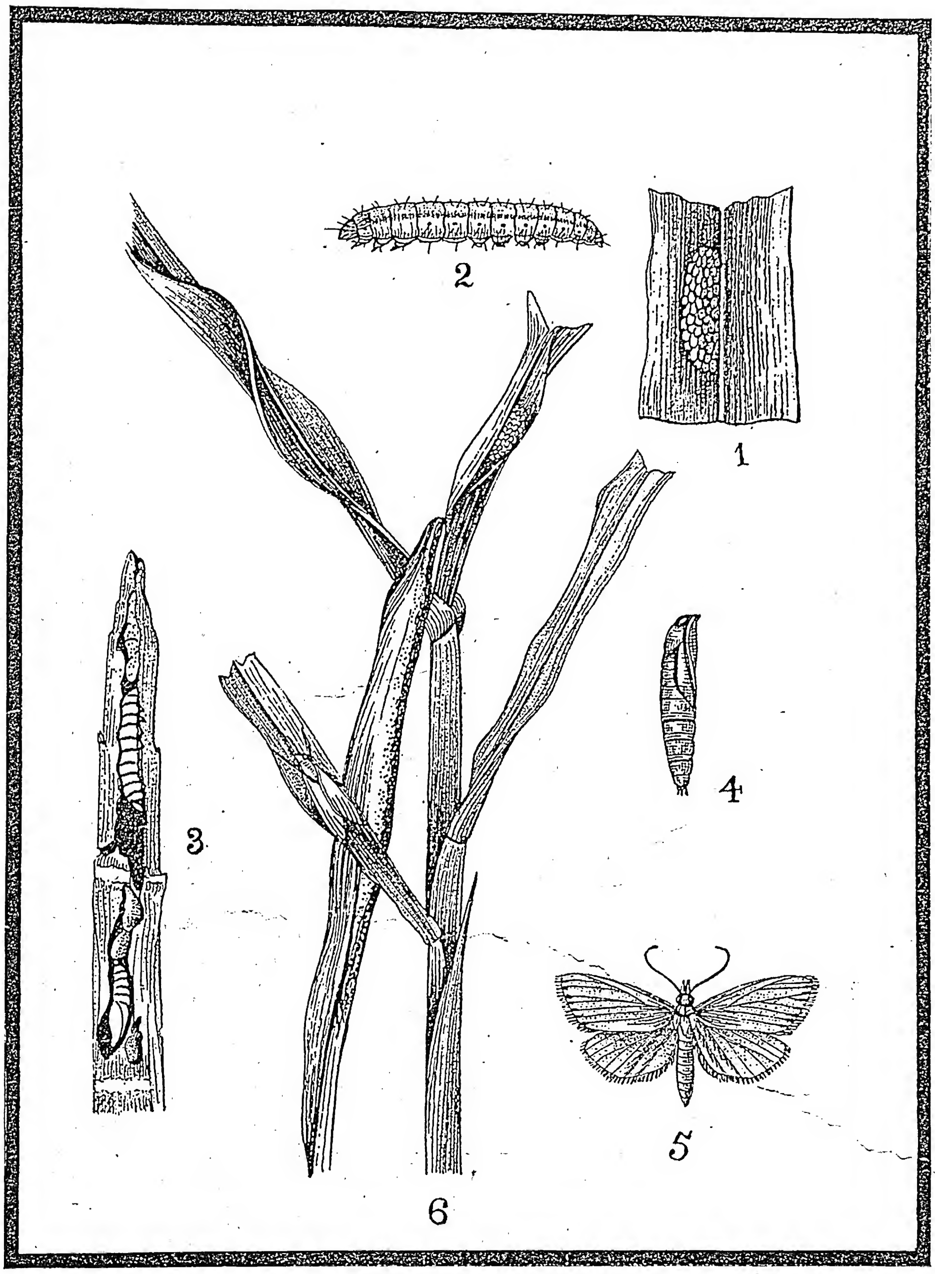
CHILO ZONELLUS

The pest attacks all parts of plants except the roots. The caterpillars begin feeding on the leaves and finally bore into the stem, where they make tunnels and fill them with frass and excreta. Oftentimes they bore into the cobs and make a meal of the tender grains. The attacked plants usually remain stunted in growth and oftentimes die as well. In a young plant the damage is characterized by the appearance of a dried up central shoot greyish white in colour commonly known as the "dead heart". The caterpillars have been observed to exhibit a gregarious tendency and sometimes fifty of them have been found congregating and damaging a single maize plant. The pest is also known to attack sugarcane plants if they are grown in the vicinity of maize or *jowar*. They also show preference to tender plants more than to the older ones.

The moths which are of dirty

WINH. AND HIEROGLYPHUS

OL. **two serious pests of Maize and Jowar**



CHILO ZONELLUS SWINH

1. An egg cluster on a leaf
2. The borer larva
3. A maize stem showing damage inside with a caterpillar and pupa
4. The pupa
5. The female moth
6. A Jowar plant showing the moth resting and an egg cluster on a leaf

brown colour are nocturnal in habit. During the day time they remain hidden under stones or dried leaves and are not usually visible to the untrained eyes. Eggs are laid invariably at nights in clusters numbering 10 to 40 on the underside of the leaves in two or three adjacent rows. They are oval in shape and are dull creamy white in colour which gradually turn black before hatching. The freshly hatched larva measures 2 to 2.5 mm. in length and 0.25 to 0.3 mm. in breadth. The full grown larva measures 20-25 mm. in length and 3 mm. in breadth. The larval period usually lasts for 16 to 24 days during the period when the pest is most active. The female pupa measures 12.5 to 17 mm. in length and 3 to 4 mm. in breadth while the male pupa is little smaller both in length as well as breadth. The pupal period lasts for about 4 to 7 days in the males and a little longer in the case of females. The moths are short lived and the longevity of the adults has been observed to last from 2 to 7 days depending on the prevailing temperature and humidity of the season. Males are shorter lived than the females. The pest has at least five generations in a year. The moths from the over-wintered larvae usually start oviposition in the field towards the end of March or the beginning of April and the activity of the subsequent generations is maintained right upto the middle of October. The pest enters into hibernation in the larval stage from about the middle of October and continues to hibernate upto the end of March.

CONTROL MEASURES

(1) All stubbles left in the field after harvest should be dug out and destroyed as these harbour the borer larvae and which become a source of infestation in the next season.

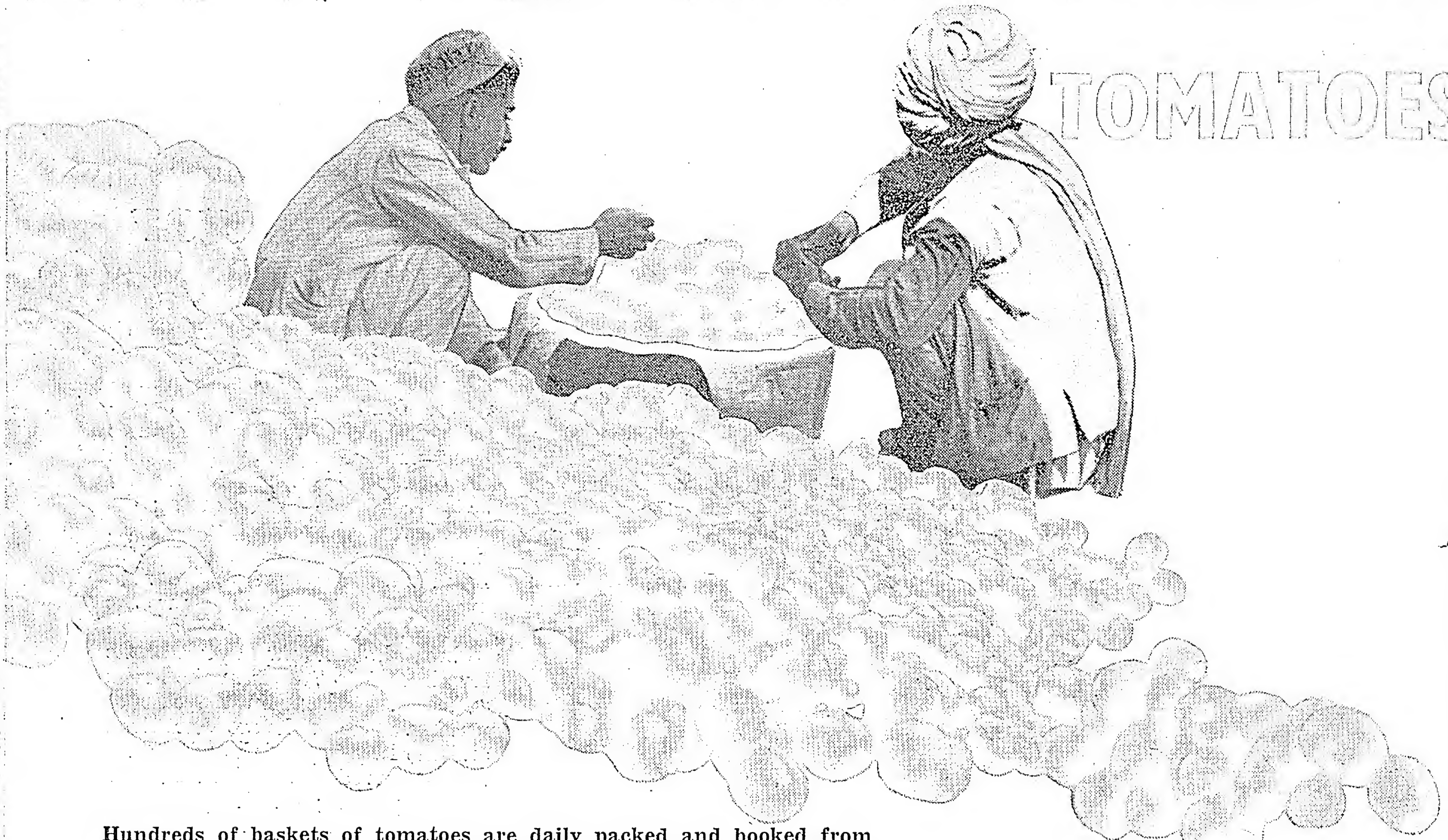
(2) In small units removal of the affected plants showing the dead-hearts with the larvae at a time when they are about 1-$1\frac{1}{2}$ ft. in height will also reduce subsequent incidence in the growing plants.

(3) In case of severe infestation light traps may be set up and the moths trapped and destroyed.

(4) The egg parasite *Trichogramma evanescens minutum* Riley may also be released in the infested plots if the egg population is high.

(*Contd. on page 32*)

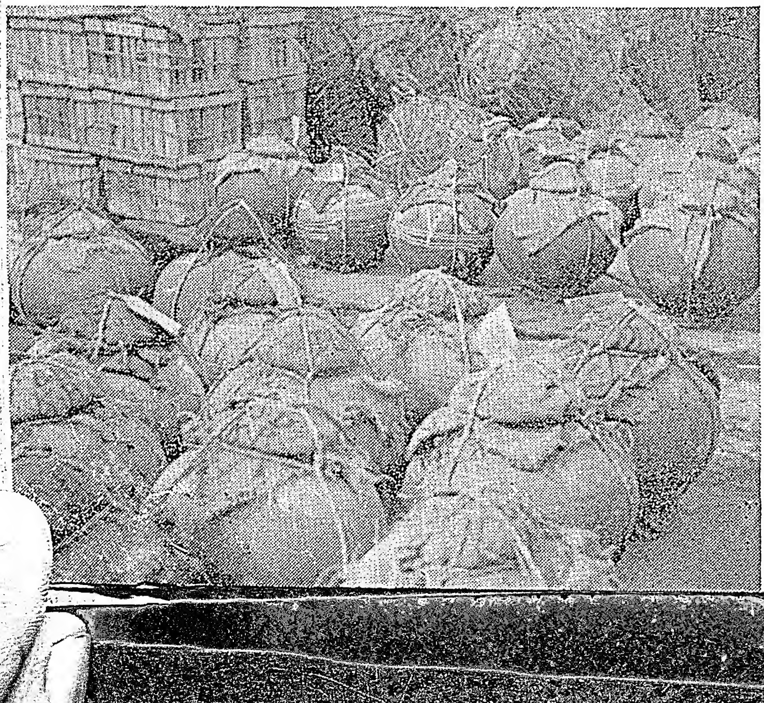
TOMATOES



Hundreds of baskets of tomatoes are daily packed and booked from Moradabad to Delhi, during February-March

WHO could imagine that the tomato which in the early years of the present century was considered poisonous by many otherwise knowledgeable people in this country, would in the course of a few decades, become one of the most highly praised of human foods ? In India, its popularity has gradually increased during the last three decades or so, due, in a large measure, to its recognition as an important 'protective' food, and also because quite a large section of the urban population has come to acquire a taste for it in salads and soups and for its juice, sauce and ketchup.

Commencing their journey from Beawar (Ajmer State) these earthen matkas carrying tomatoes are awaiting another lift from the Delhi main railway station to Subzimandi



Delhi—the metropolis of India—has now a population of about 14 lakhs, large part of which comprises people who use or like to use tomatoes, all the year round. During the main crop season, supplies in Delhi State and its neighbourhood are abundant, and prices "accommodating". In the off-season, however, when the supplies are received from distant places the housewife simply grumbles over the soaring high prices and perhaps curses the poor grower, not realizing that it is the overall expenditure incurred in the stages between the producer and the consumer that makes the difference in prices, and the grower hardly gets his just share.

CONTRIBUTION BY DELHI

The marketing facilities have induced many a Delhi cultivator to grow vegetables, in various parts of Delhi State. The produce of tomatoes from Delhi State, however, meets only a meagre part of the total requirements of the metropolis. In commercial cultivation, two crops are generally raised, viz. the autumn-winter crop transplanted in July-August and the spring-summer crop transplanted in December-January. The winter crop is grown largely in the *khadar* (Bakhtawarpur, Palla and Majra villages) and *bangar* (Haiderpur, Samehpur, Badli, Libaspur, etc.) areas and in village Khirki in *khandrat*. The summer crop is restricted to the Bela Estate—Yamuna bank near Rajghat, where a fine crop of tomatoes is raised. The produce from the *khadar* and *bangar* areas comes to the main vegetable market in Subzimandi while that of the Bela Estate and *khandrat* reaches Phul Mandi in Daryaganj.

IN METROPOLIS

By **H. B. SINGH,**
Division of Botany, Indian Agricultural Research Institute, New Delhi

In the off-season, almost a complete wing of the main vegetable market in Subzimandi is occupied by tomato traders. The off-season tomatoes receive an affectionate care in handling

For the autumn-winter crop, invariably the variety 'Meeruti' is cultivated. It has medium-sized, flattish fruits with shallow furrows and not too much cracking; the full-ripe colour is deep red and the taste is highly acidic. The fruits have good keeping quality. The variety grown in the Bela Estate for spring-summer crop has smooth, round, medium to large fruits but there is less uniformity in size and colour.

SUPPLIES FROM OUTSIDE DELHI

Rainy season supply: Tomatoes are more costly during the rainy season. The hill tomatoes received during this period are usually large, round or flat, soft to the touch, smooth or slightly fasciated. During this period, pear-shaped tomatoes are received from Kangra and Kulu valleys. In quality, Saiya tomatoes are considered superior to other hill tomatoes.

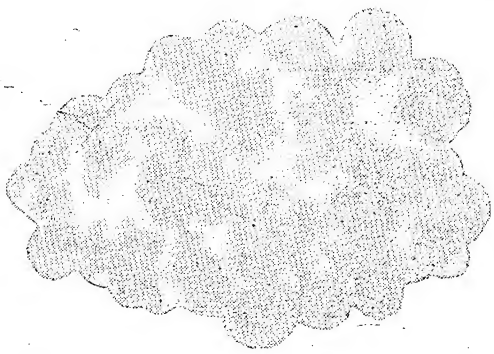
Autumn supply: The produce of Ajmer, Nasirabad and Beawar is especially important since it is received at a time when the tomato crop in other parts of the north Indian plains is still not ready. The tomatoes from these places are either spherical or flattish. The supplies from Kotah start about two to three weeks later than that from Ajmer.

Anybody witnessing the unloading of tomatoes from the mail train from Ajmer, arriving in the morning at the Delhi-Sarai Rohilla station, during mid-September to mid-October, will perhaps gain the impression that during this period the tomato fields in Ajmer or Nasirabad would be full with red, ripe fruits. Actually this is not the case. When the season starts the ripening is slow and the cultivators are able to harvest hardly 5-10 seers from a 1/5 acre plot or so and that too not every day. In the Ajmer area, the individual cultivators usually grow about 0.25 acre of tomato each but because there is a large number of cultivators growing the autumn crop, sufficient quantities reach the market to enable the traders to carry on.

Tomatoes marketed from Nasirabad are packed in perforated kerosene oil tins while those from Beawar are received in earthern pots—*matkas*.

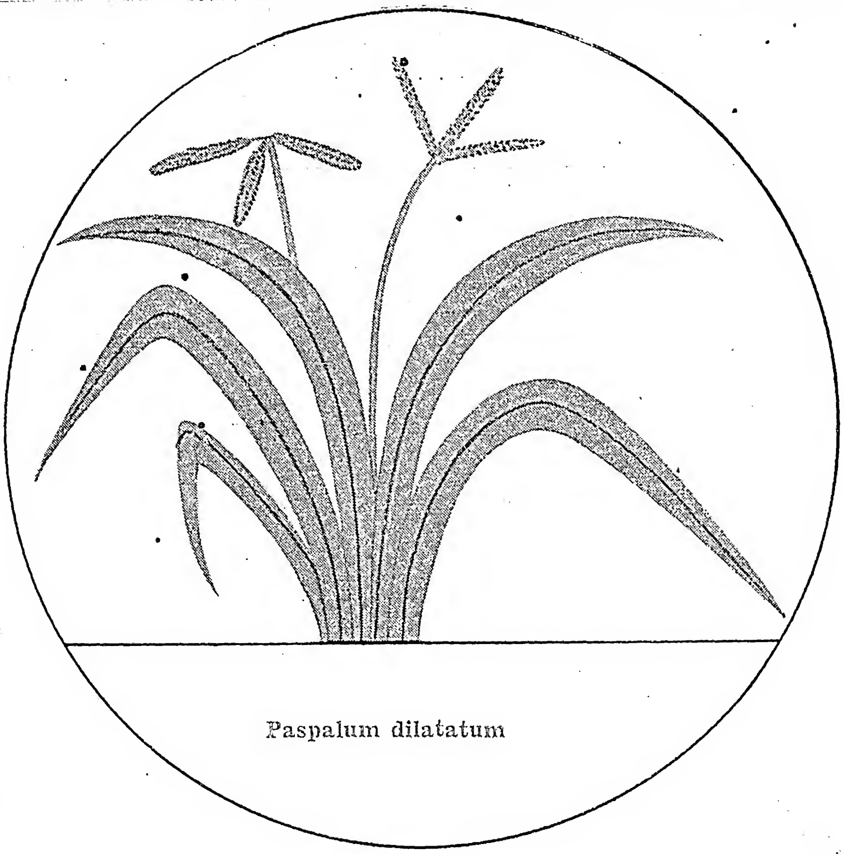
Winter and summer supply: Most of the winter supply is local and from nearby places like Meerut and Hapur. The tomatoes from these places are of the

(*Contd. on page 27*)



The Moradabad tomatoes, large in size, are not of an attractive shape. The "metropolitan" has to welcome this stuff in the off-season

STORY OF A GRASS IN ASSAM



Paspalum dilatatum

By
D. L. PAUL
Assistant Deputy Director of Animal Husbandry & Veterinary Department (Livestock), Assam

An old Nepalese childless gardener was put a question by his friends, "Why don't you adopt a son?" His reply was almost a counter-question : *Basu Sahib ka ghas ka mafik larka kahan milega* (Where shall I get such a lucky one as the grass of Mr. Basu ?) In his early life he had worked under Rai Bahadur B. C. Basu (Father-in-law of Shri Aurobindo) who as an Agricultural Officer under the Government of Assam first introduced the Australian blue-grass (*Paspalum dilatatum*) in that State some forty years back. This little story indicates how successful this introduction was and how much it has captured the notice of the common man.

Assam has a rich flora of grasses growing in different regions with varying elevations and climatic conditions. The fact that there are a number of wild bovine species in this State is probably linked up with the existence of numerous species of pasture grasses. There do not appear to be many grasses which may be both nutritious for and relishable by the cattle in any one region. In fact old cattle owners state that, before the introduction of *Paspalum dilatatum* there were no good grasses in the pastures and meadows around Shillong. Soon after its introduction however, this grass, established itself firmly in that region and supplemented the coarser and less nutritious grasses of its pasture lands. At present the grass flourishes there at elevations varying from 3000 to 5000 feet. The average annual rainfall in this region is about 112 inches. Frosts are frequent during the winter season. But this grass stands it all very well and puts forth new shoots early in spring. As a result of the grading-up of local cattle with Ayreshire and

Fresian bulls, Shillong has now the best milch cattle population in Assam. Average milk yield is from 8 to 15 seers daily but cows yielding even 30 seers of milk daily are not rare to find. But it can be said without any fear of contradiction that *Paspalum dilatatum* has contributed a great deal to this improvement.

Paspalum dilatatum is 6-9 ins. high and when it grows naturally under protected conditions it yields some 150 md. of green grass per acre in several cuttings. Under proper cultivation and management it would no doubt give much higher yields. Nutritional value of the grass may be judged from the following figures:

*Chemical Composition of Paspalum Dilatatum Hay**

(On moisture free basis)

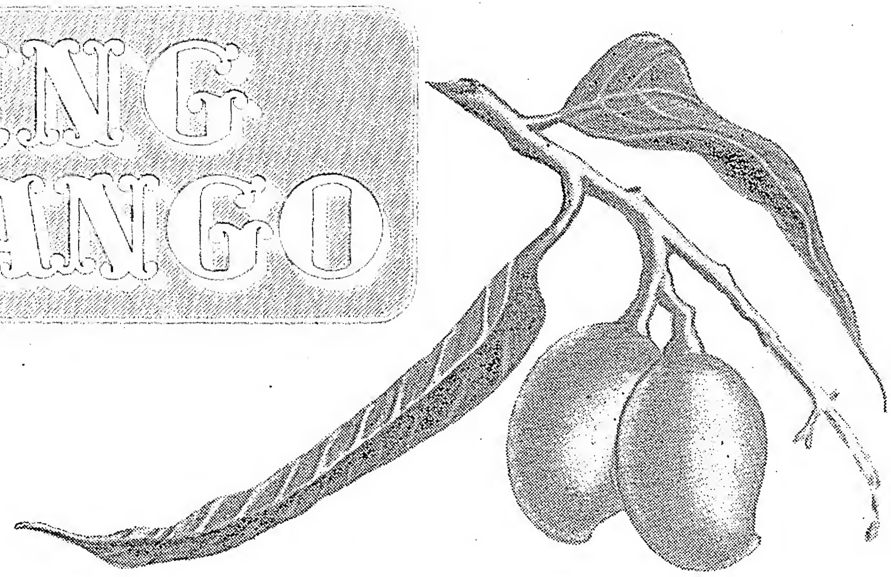
	Protein	Calcium	Phosphorus
Early cut	9.4	0.45	0.19
Late cut	6.25	0.39	0.18

Paspalum dilatatum is not only an ideal pasture grass but can also be used for the stall feeding of cattle as well as for making silage and hay. Its bluish green colour is very pleasing to the eye and it seems to contain an appreciable amount of Carotene. Butter produced from the milk of a cattle fed on this grass is naturally yellowish and does not require the addition of artificial colour.

* Courtesy the Physiological Chemist, in-charge of the Cattle Nutritional Scheme, Assam

KING MANGO

By
RAMPA PAL



Green fruits with a half-faded flower

IN India the king of fruits is the mango. Its coming into season is hailed with delight by rich and poor all over the land.

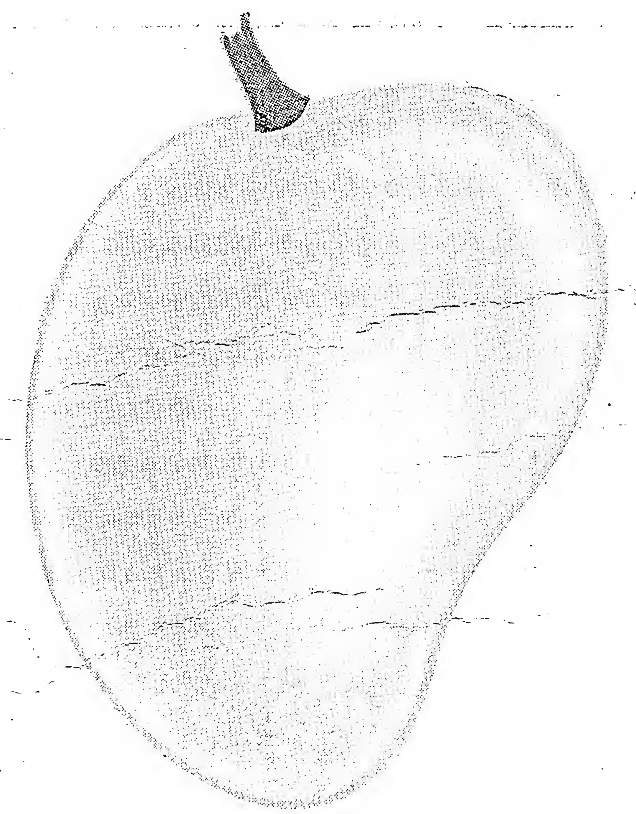
It is a beautiful fruit with a wonderful flavour. Nobody knows where it originated from but it may correctly be assumed that it first grew in India. It grows well in the monsoon lands of S. E. Asia and even flourishes in the West Indies to which place Vasco-da-Gama carried plants after he visited India. There are several hundred varieties growing in India and one or two grow even all the year round while in Madras and Bombay areas, the green fruits are in season as early as December.

During the mango season in Uttar Pradesh the country people generally make a lunch of mangoes with just a pot of rice. But in the West Indian Islands of San Domingo and Haiti the natives rarely cook meals and live on mangoes for weeks when they are in season.

The finest variety from the West Coast region is the Alphonso and a close second is the Pairi. The delicious flavour and golden colour with rosy red tops are truly a grand combination. In the Andhra and Tamil Nad areas, the apple-sized round, juicy fruits with tiny stones, are the Rumani and the huge—almost as big as a coconut—Banganapalli mangoes with their sweet, soft and fibreless pulp. It also has a small stone seed. Coming to North India where there are a large number of aristocratic varieties the best known ones of which are Malda, Kishen Bhog, Langra and Bombai of Bengal and Bihar while the green skinned Fazli, Duseri, Sufaida and Chaursa, reign supreme in the Lucknow region. In the Punjab, where the season is later than elsewhere, the mangoes are small and are chiefly the sucking variety, having more juice than pulp but possessing a fine flavour. Mandi, in Himachal Pradesh, is noted for its mangoes. Burma, formerly a province of India during the British regime, has lovely varieties, the most famed being the Net-Tet of Mandalay division, the fine flavoured Ma-Nwe and the Thôn-Lône Tadaung or "three-make-a-foot" longish, green-skinned fruits with orange red pulp and thin flat stone.

Preserves, chutneys—both fresh and bottled—salads and squash are prepared from green and ripe mangoes. During season, children and parrots are the great problems to the owner of a mango tree or orchard. Indiscriminate eating of green mangoes can cause tummy upset, sore eyes and boils but if a big green mango is baked (or roasted in hot ashes) and the pulp is sucked with a little salt, it is a sovereign remedy and effective cure for heat stroke or Loo. At least, this is the way, village folk of Bihar and Uttar Pradesh get rid of sun stroke.

In Madhya Bharat, a delicious summer drink is made from boiled green mangoes and served with ice.

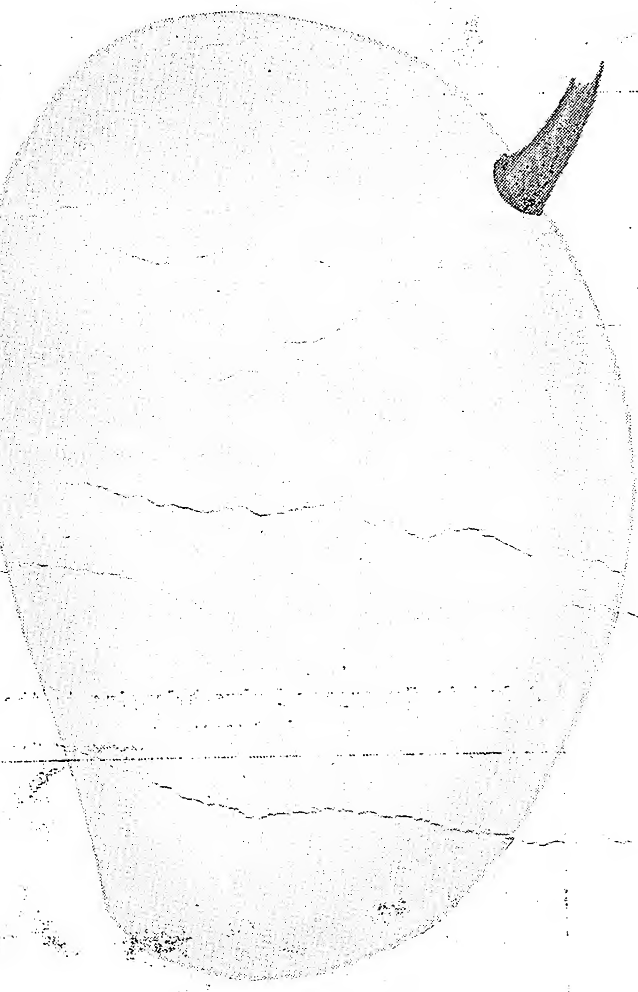


Alphonso

It also helps to ward off heat stroke symptoms. In colour this drink is just like lime-juice cordial.

The modern Indian woman substitutes golden mango slices for peaches in her ice-cream. The street vendor usually has a good sale when he chills his mangoes on a big slab of ice. These additions add zest to the flavour. The food value of the mango is high. In the green mango, the percentage of iron (100 grammes) is 4.5 and 11 calories per oz., but in the ripe fruit the calories are 14 per oz. and Vitamin A, 4,800 (Int. units per 100 grammes) and Vitamin C is 13. The mango tree is very useful in our country. Its tender leaves, flower buds, green and ripe fruits are used as food. Its bark, twigs and leaves figure in religious ceremonies. The Toran or garland of mango leaves is considered auspicious and may be seen strung across doorways of new houses or on festival days. Even its seed kernels are of use in medicine and as flour in times of scarcity. Shrimati Lilawati Munshi, Vice-President of the All India Women's Food Council, has brought out a monograph on the mango seed kernel as food and fodder.

In our poetry, legend and even in stitchcraft, the mango holds an honoured place. Our poets, ancient and modern, sing of mango groves, the fragrance of mango blossom in spring time and the melodious call of the Koel is heard only when the mango is in flower.



Banganpalli

There is much scope for King Mango to earn dollars and pounds for our Exchequer. There are great commercial possibilities for it. Pandit Jawaharlal Nehru's gift baskets of Alphonsoes—"Say it with Fruits" is an old custom of India—can only reach a few personal friends. But a well-organized propaganda and publicity drive (like the Empire Tea Sales Board) overseas during season with a band of well trained men and women could have the way for a rich export trade in mangoes. Our young canning industry has every chance of success internally and externally if it forges ahead in utilising the best modern methods of fruit canning for the mango.

MANGO PREPARATIONS

A salad and a squash recipe are given below for the interest of readers—both are from green mangoes :

Ingredients : One cup mango pulp juice (prepared by boiling one seer of green whole mangoes and squeezing out their pulp)

1½ cups sugar
(Two cups if the pulp is too acidic)
Cardamom seeds from three or four spods—to be powdered
(Elaichi)
One pinch of yellow vegetable dye
(Kesar may be used instead if desired)

Method :—Mix the above thoroughly and keep by in a wide mouthed glass bottle. Whenever required take out two or three tablespoonsful. Add water to fill a tumbler. Mix well, add crushed ice and serve.

Note :—This solution will keep only for a week but if kept in a frigidaire, it can be kept indefinitely.

GREEN MANGO SALAD

Ingredients :	Green mangoes, four or five
Fried onion (chop fine and fry)	One or two large ones
Salt and chilly powder	To taste
Roasted gram powder	Two or three heaped-tablespoonsful
Til oil—previously heated and cooled	Two tablespoonsful or more
Chopped green spring onions	Two stalks
Pudina or Dhaniya leaves	A few

Method : Peel the mangoes and grate them. Immerse in boiling water (i.e. bring water to the boil, remove it from fire and put the grated pulp in it) and squeeze out lightly and place the pulp on a plate which may have clean mango leaves under the pulp for decoration. Add oil, gram powder, salt and chilly powder. Garnish with fried onions and greens and mix well just before eating.

Note : If the green mango is not too sour, then do not immerse in hot water. Some mangoes are very sour, hence immersion for a minute or two will help reduce the sourness.

SEWARGAON - DUKRE THE VIL

by
A. R. VYAS

The village temple, which apart from being a house of prayer is also the place where village marriages are celebrated

Shri Santosh Rao Patil the moving spirit behind Sewargaon-Dukre's progress

A small community with 73 per cent of its women and 71 per cent of its men literate, a compact area of about 1200 acres from which the evils of drink and untouchability have been wholly banished, and cooperative effort which runs a rural school and a library, and maintains a temple whose doors are open to the whole commnuity—that in short is village Sewargaon-Dukre, situated in the Buldana district of Madhya Pradesh. Behind its 240 neat white-walled huts, each of which bears a number and the name of its owner, lie the unostentaticus effort and cooperative endeavour of its people for nearly two decades.

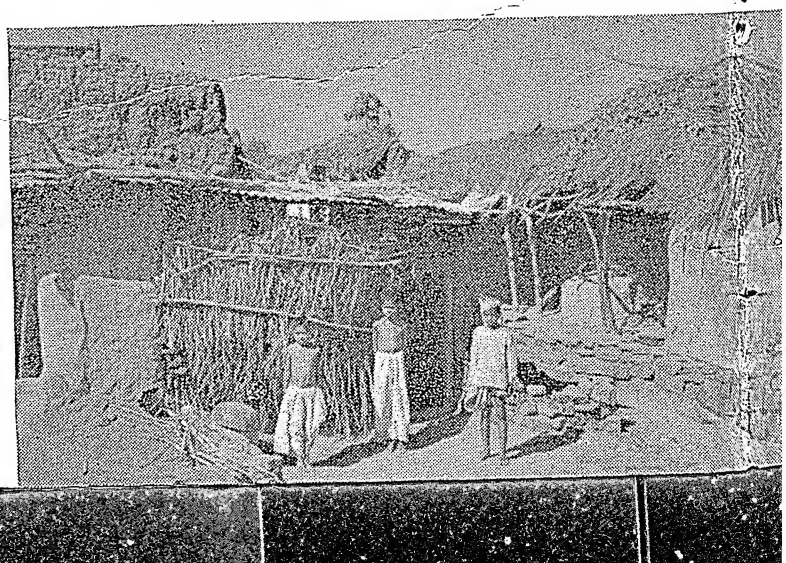
This village of 1130 inhabitants lies in the Chikhli Taluk and is reached from Buldana, the District Headquarters by a road of which is motorable for about 14 miles. Thereafter the going is slow, over a bullock cart track, which conceals many a dangerous pot hole under layers of thick brown dust. This two-mile journey however is worthwhile, for once you reach Sewargaon-Dukre, the discomforts of the heat and dust and travel over a tortuous track, are forgotten in the admiration of a virile rural population seeking to solve its problems by its own cooperative efforts.

At the entrance of the village stands the village temple, which bears the ennobling inscription in Deva Nagari "True religion knows no barriers of caste or colour". This is no mere inscription; it is one of the tenets of the faith of the people of Sewargaon-Dukre, for they have completely abolished untouchability. There would be few towns and villages in India which could aspire to such a distinction!

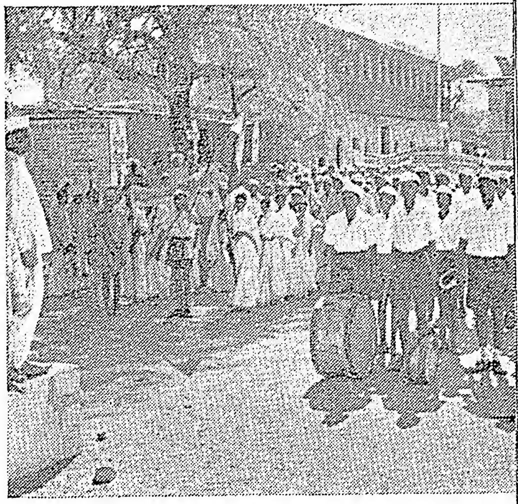
A few yards in front of the temple stands a *nim* tree. Under its cool spreading branches, is a black board, which serves as the daily news sheet of the village. On it, written in neat Marathi letters, appears the news of the day. On the day that I was in the village last March, I read of the earthquake in Turkey, the failure of the pourparlers between the Prime Minister and the leader of

The "Samaj Vikas Kendra", focal point of all village activities. The building was opened by the Union Agriculture Minister in November 1952

A hut in Sewargaon-Dukre belonging to the lowliest —a Harijan



LAGE WITH A PURPOSE



Smartly dressed young men of the "Seva Dal" man the village band, which goes round the village on days of national festivals

the Indian Praja Socialist Party, and other items of State, district, and village importance. The senior students of the village school, run this daily "newspaper", culling the various items from the news bulletins of All India Radio heard over the village community set.

SANTOSH RAO PATIL—A BORN LEADER

The success which has come to Sewargaon-Dukre is largely due to the excellent leadership of 36-year old Santosh Rao Patil and his fellow workers. Santosh Rao is a down-to-earth thinker with a practical imagination. He knows the hearts and minds of his fellow villagers as clearly as he knows how to raise bumper crops of cotton, *jowar* and wheat on the family holding of 300 acres. For 19 years he and his fellow workers have worked incessantly, instilling social sense among the people and laying the foundations of a new village life, free from dirt, disease and ignorance. The bond that has brought together the people of the village into a homogeneous group is an overriding sense of unity of purpose. In the words of the Union Minister for Agriculture who visited Sewargaon-Dukre in November 1952: "It is this unity that has enabled the people to achieve so much within so short a time. The people of Sewargaon-Dukre have truly transformed the village."

PRIDE OF VILLAGE

From the moment that I entered the village till I left it nearly three hours later, I was struck with the sense of pride which the villagers have in the well being and progress of their Sewargaon-Dukre. Painted in bold Marathi letters on a prominent wall, one reads the following exhortation to the village people:

I shall not do anything which brings disgrace to my village.

I shall do my very best to make my village an ideal one.

I shall faithfully observe all the laws governing my village.

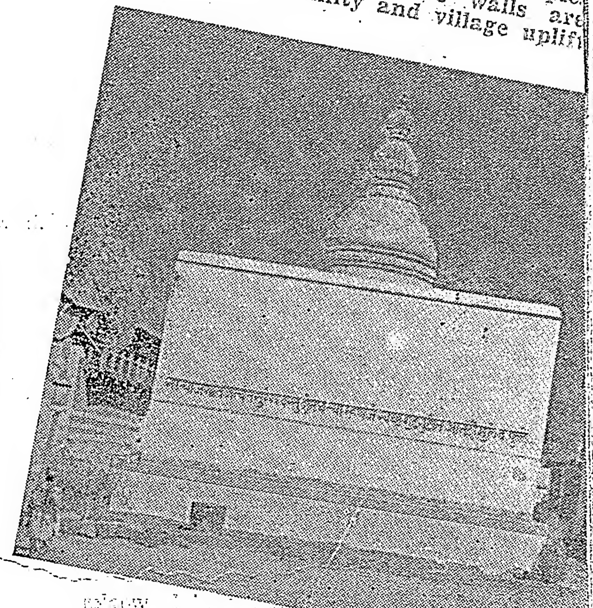
It will be my earnest prayer that my village shall progress from year to year, and to this end, I shall fulfil my allotted tasks.

Slogans similar in content hit the eye in different parts of the village, and the ideal of hard work and selfless service is emphasised over and over again. The results are seen in clean village houses, dirt-free lanes, the smart appearances of the boys and girls and the unmistakable sense of pride in the village inhabitants, most of whom are agriculturists. This was exemplified in the remark of a fifty-year old who told me that while a deadly cholera epidemic swept through the surrounding villages in 1946, Sewargaon-Dukre remained unaffected "because our village is so clean!"

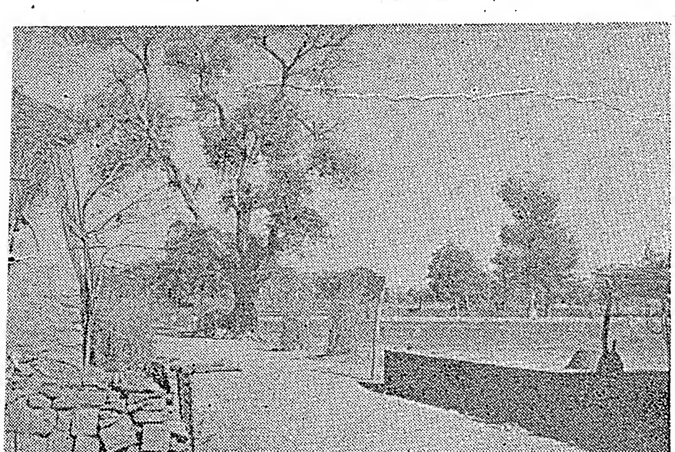
To keep disease at bay, the village dispensary has been distributing cheap and effective remedies for the last 12 years.

(*Contd. on page 28*)

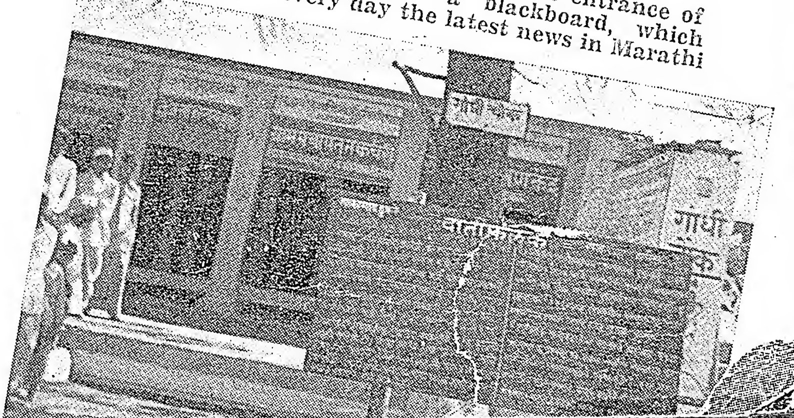
A back view of the village temple. Painted on its white walls are slogans of unity and village uplif



The villagers have completed half a mile of road through voluntary labour. This would normally cost the village more than Rs. 1,250



In the "Gandhi Chowk" at the entrance of the village stands a blackboard, which carries every day the latest news in Marathi



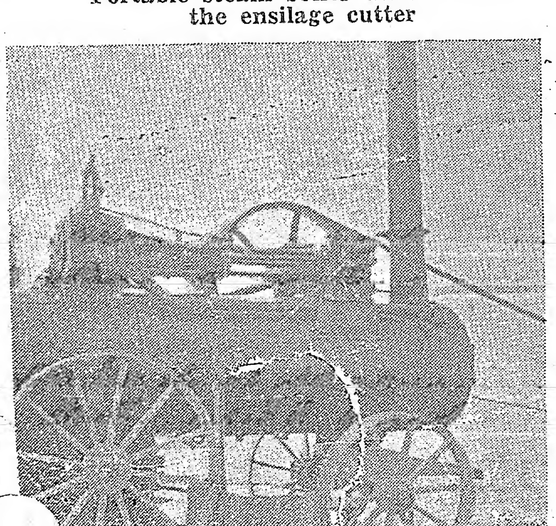
SUGARCANE AND OATS SILAGE

By
YASHPAL CHANDRA GUPTA,
Agricultural Officer, Government of India,
Cattle-cum-diary Farm, Karnal

Ensilage cutter fitted with a feed pipe for blowing chopped fodder into the silo tower

SUCCULENT fodder is considered a necessity for feeding dairy cattle especially the cows in full flow of milk. Such feed is not available throughout the year, and it has been observed by successful dairymen in the more progressive nations that this difficulty could be overcome by converting the available green fodder into silage. Many varieties and combinations of green fodder producing satisfactory tonnage per acre have been converted into silage for providing succulent feed, especially during summer when green fodder is not available. Much of the research conducted by agricultural institutes is directed towards the solution of definite practical farm problems. One such important problem is that of feeding livestock economically. Due to a sudden drop in the price of *gur*, a large quantity of sugarcane was available for use as cattle feed. Experiments showed that the livestock thrived well on chopped sugarcane. Thus encouraged, the possibilities of preserving sugarcane as silage were explored and the results achieved are given in this article.

Portable steam boiler which works the ensilage cutter



PROCEDURE

Sugarcane with tops and some dry leaves with an almost equal quantity of green oats were used for making silage. They were mixed just prior to ensiling by the ensilage cutter. The chopped material was blown into the masonry silo-tower. The chopping continued at the rate of eight hours a day for a period of 22 days. During the chopping and filling of the silo-tower water was continuously sprinkled over the cut material in the tower. Every day in the morning before the filling operation was commenced, ten men were allowed to trample over the collected material in the tower for an hour in order to pack the material

fairly air-tight. Air-pockets tend to encourage the growth of moulds and spoil the silage. As such the packing of the cut material was very essential. When the tower was filled to the top, it was well levelled and covered with a layer of *kans* grass and then plastered with mud in order to make it air-tight. It was left in this condition for six weeks within which time fermentative changes took place. Green oats as such would not form good silage since the sugar content for fermentation is less but the addition of sugarcane made up this deficiency. It was thus observed that mixture of whole sugarcane and green oats formed a good combination for ensiling.

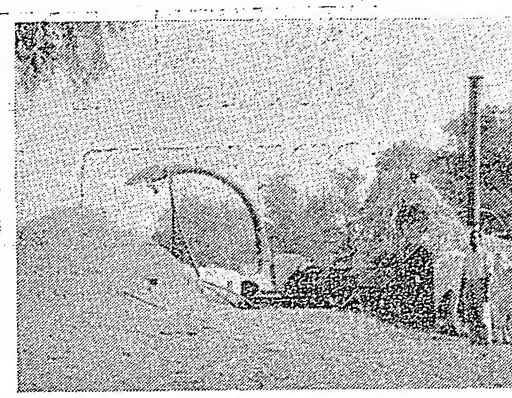
FOOD VALUE OF SUGARCANE AND OATS SILAGE

The silage was of a fine yellow golden colour with a pleasant aroma. The quality of sugarcane and oats silage was very good and the cattle relished it so much that not a single blade was left behind in the trough. The result of an analysis of a sample of sugarcane and oats silage carried out at the Indian Agricultural Research Institute is given below together with the analysis of *jowar* silage for comparison :

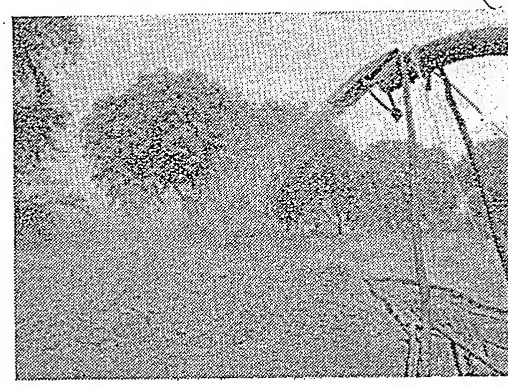
	Sugar-cane, oats silage	Jowar silage
Moisture	72.07	77.5
Crude protien	3.40	5.59
Ether extract	2.38	3.90
Crude fibre	30.84	36.85
Ash	9.09	13.57
Sand and insoluble silica	5.13	7.67
Soluble mineral matter	3.96	5.90
Soluble carbohydrates	54.29	39.81
Food units	68.74	63.30

The above data reveal that percentage of crude proteins and sand and insoluble silica is less in sugarcane and oats silage than in *jowar* silage. This stuff is passed undigested by the animals. The percentage of soluble carbohydrates is more in sugarcane and oats silage

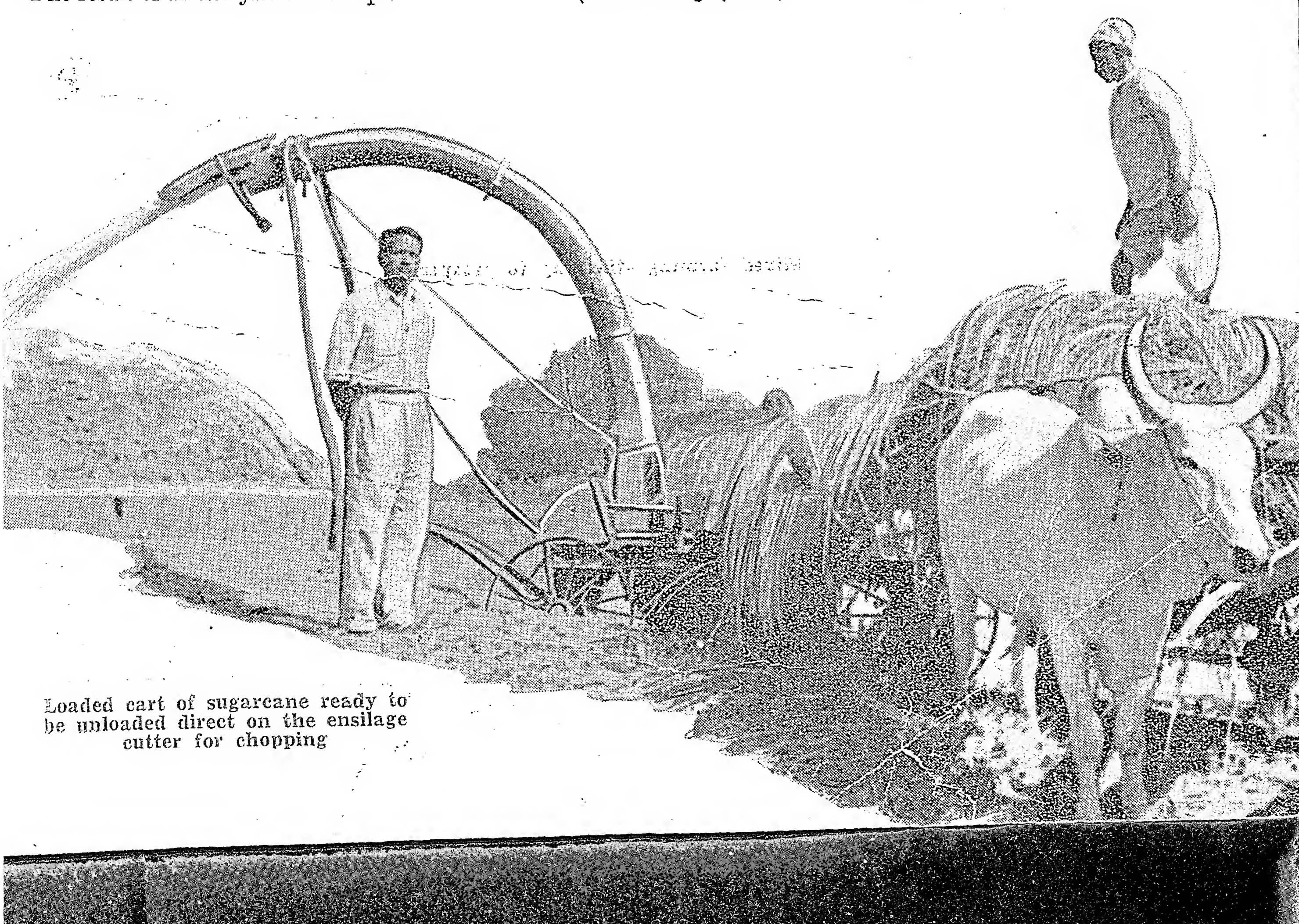
(*Contd. on page 30*)



Cartman dropping the bundle of sugarcane direct on the ensilage cutter from the top of cart



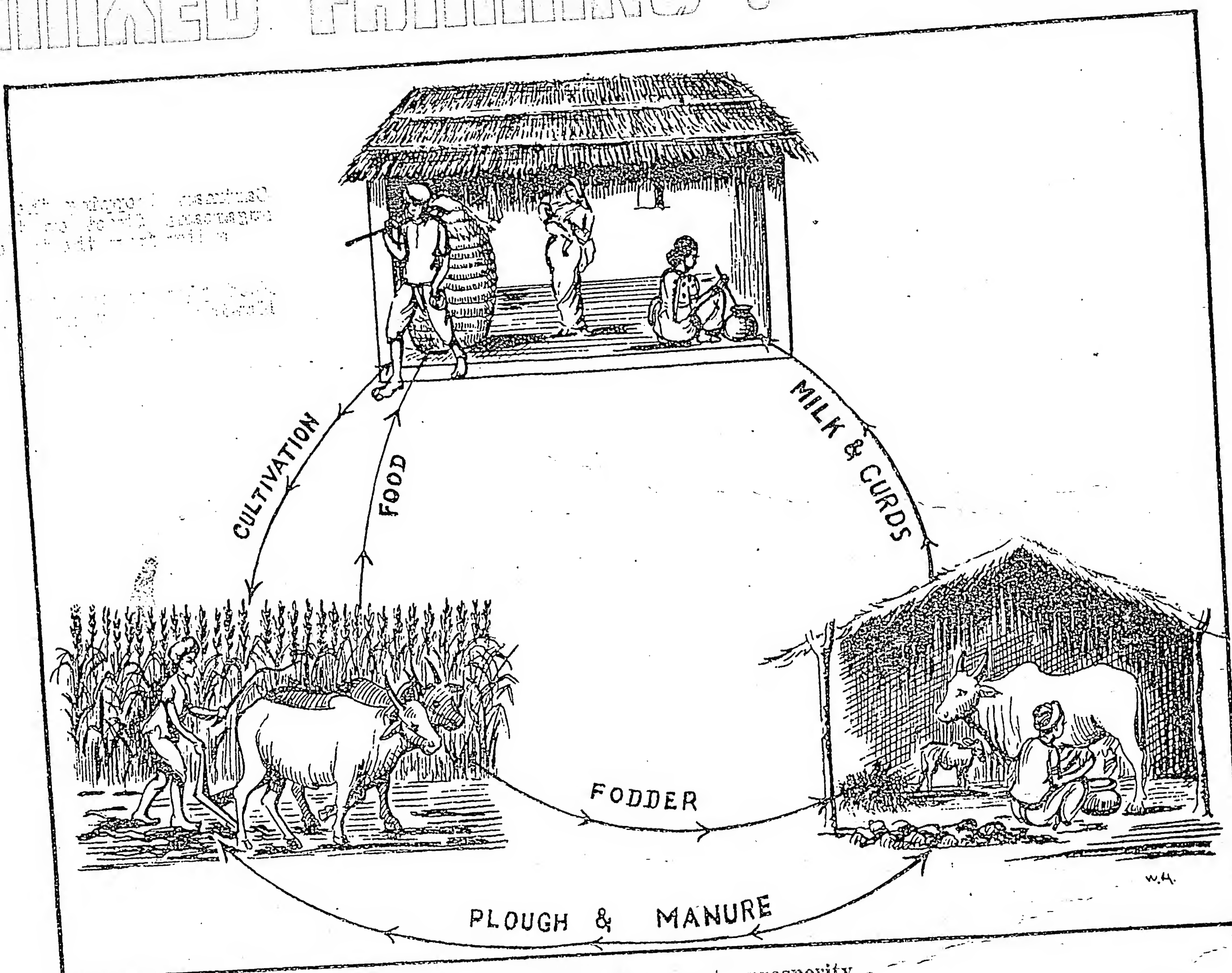
Feed pipe of the ensilage cutter blowing chopped material into the masonry silo pit



Loaded cart of sugarcane ready to be unloaded direct on the ensilage cutter for chopping

WHY PRACTISE MIXED FARMING?

By
P. C. RAHEJA
and
S. R. OBHRAI
Division of Agronomy, Indian Agricultural Research Institute, New Delhi



Mixed farming—the way to prosperity

MIXED farming is a system of crop and animal husbandry for efficient and effective use of land, labour, stock and capital. In this system the organising capacity and the initiative of the farmer come into full play. In India where by reason of monsoon, the agriculture is seasonal in nature, the subsidiary occupation of milk production solves indirectly the problem of enforced idleness of the agriculturists, provides animals for the cultivation of land and partially meets the manurial requirements of the soil. In the process the farmer and the family, the animals and the soil remain well nourished.

LESSONS OF INVESTIGATIONS

In 1941 the Indian Council of Agricultural Research coordinated experiments on small holdings to investigate the value of mixed farming in comparison to arable farming. Four States, namely, Uttar Pradesh, Madhya Pradesh, N.W.F.P. and Sindh cooperated in this project. These experiments proved beyond doubt that there was general increase in income from both cash and food crops in the mixed farming units, no matter whether these were located close to the urban or the rural areas, compared to the arable farming units. There was evidence of a definite increase in the fertility of the land. Milk and milk products were readily available as protective foods to the families of the mixed farming unit holders. The family labour was profitably utilized in the subsidiary occupation for earning extra income. Nearly 75 per cent more income was derived from the mixed farming units than in the ordinary farming system.

The working of the scheme in Madhya Pradesh from 1941 to 1946 indicated that

(i) a unit holding of $12\frac{1}{2}$ acres worked with a pair of bullocks proved capable of maintaining two buffaloes without the need of purchasing fodder from outside,

(ii) the cultivator practising mixed farming could earn extra income varying from Rs. 200 to 250 by sale of milk and Rs. 125 to 200 from butter,

(iii) the supply of manure was increased by about 15 tons, and was sufficient to manure another three to four acres,

(iv) the extra manuring enabled production of sufficient surplus dry fodder and grain to cover scarcity periods of fodder supply,

(v) about 25 to 30 per cent extra milk and milk products' consumption by the family provided additional nutrition and,

(vi) the extra manure supply enabled the farmer to grow ½ to 1 acre of a cash crop very successfully.

It is necessary to mention that the funds for the purchase of milch stock and setting up of the units were provided by the Government as *taccavi* loans which later on could be recovered by instalments.

In Uttar Pradesh the comparable mixed farming units were located in the districts of Meerut, Bareilly, Lucknow, Bara Banki, Gorakhpur and Deoria. The sizes of the holdings varied from eight to ten acres in the different districts. Details of the income from the mixed farming units compared to the arable units were as under :

and a pair of bullocks, and in the eastern districts, two milch stock and a pair of bullocks on 8-10 acres holdings.

The area of mixed farming units in the N.W.F.P. varied from five acres in the most intensively cultivated holding in the Charsadda Tehsil of Peshawar district to 12 acres holding in Paharpur Tehsil of Dera Ismail Khan district. Mixed farming positively increased the yields of grain and cash crops, the gain being less under the drier conditions of Dera Ismail Khan compared to that in the amply irrigated areas of Peshawar and Mardan districts. The returns were comparatively less from the mixed farming units in the submountainous and mountainous regions of Kohat and Abbottabad districts. The income in the latter case suffered due to lack of market facilities. The extra manuring applied to the sugar cane and tobacco crops increased the gross returns from these crops in the mixed farming units in comparison to the arable units.

In Sind, three mixed farming units on a comparable basis with the arable farming units were set up. The size of each holding was 24 acres. The increased returns per acre on the average for three years for the Tharparkar, Nawabshah and Hyderabad units were 16.1, 18.7 and 12.8 per cent respectively. The Sind *hari* could maintain two milch animals besides a pair of bullocks. For these animals he could obtain from the holding dry and green fodder and part of the concentrates. By keeping two milch animals on the average his income on the holding was increased by Rs. 281. The extra income varied in relation to the market value of animal products and incentive to produce more because of the nearness of the market.

*Average profits per acre of all holdings**

Unit	First year	Second year	Third year	Fourth year	Fifth year	Mean
	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as.	Rs. as
Mixed farming	23 15	95 5	141 2	122 6	169 6	110 7
Ordinary farming	17 7	61 13	67 3	46 6	65 5	51 10
Per cent income over ordinary farming	37.4	52.9	110.0	167.3	159.3	105.4

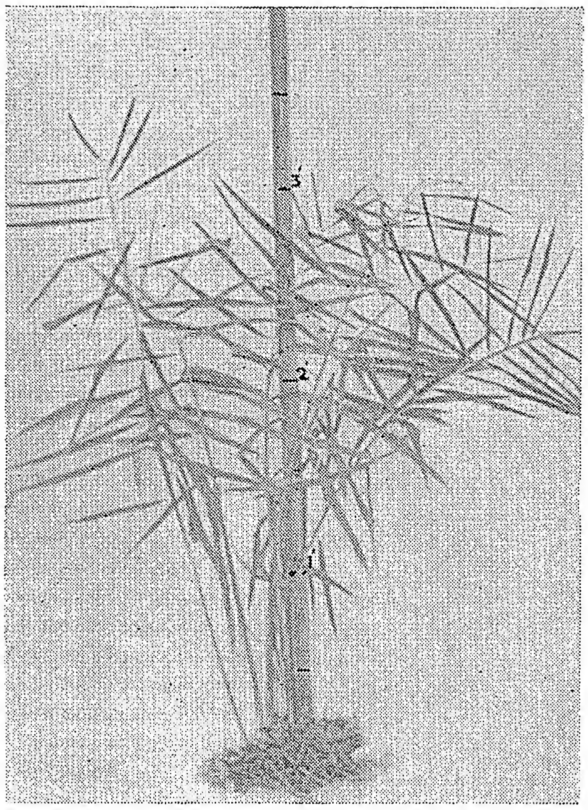
* *Indian Farming*, August 1950; p. 327

The Bara Banki unit gave the lowest extra income and depressed the general income level of all the units.

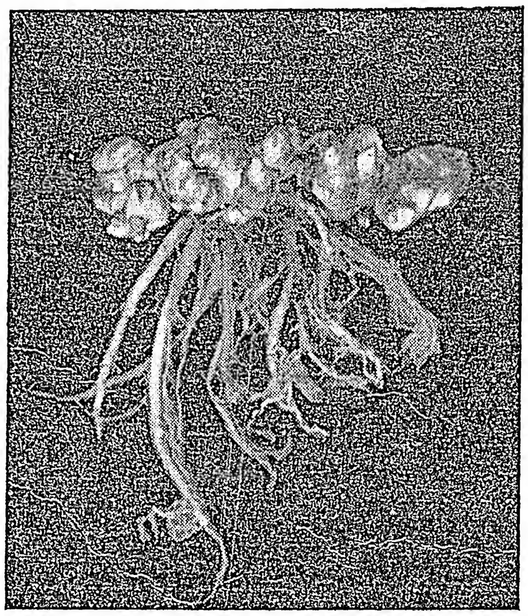
From other units the extra income ranged from 37.4 to 167.3 per cent over the comparable arable farming units. This increased income was possible as a result of the production of milk, greater employment of the family and extra yield of cash, fodder and grain crops. In the western districts the mixed farming unit holder could maintain three milch animals

(*Continued on page 30*)

GINGER CULTIVATION IN MALABAR



A ginger plant



Rhizomes with roots

By
A. ABDUL SAMAD

GINGER, *Zingiber officinale* Rosc., is one of the most important spices obtained from the rhizomes or underground stems of plants belonging to the family Zingiberaceae of the natural order Scitamineae. The crop is believed to be native to tropical Asia and is cultivated in the West Indies, India, Africa, China, Japan and Dutch East Indies. This appears to have been used as spice and medicine from the early times by both Chinese and Indians, there being numerous references in the Chinese medical treatises and in Sanskrit literature. The Romans regarded the spice as being of Arabian origin owing to the fact that they obtained the supplies by way of Red Sea. The spice seems to have reached France and Germany during the ninth century coming to England a little later. The Spaniards introduced the plant into Mexico and Jamaica during the 16th century.

Ginger is the rhizome or underground stem of the herbaceous plant attaining a height of one foot to three feet or more and the stem is enwrapped by sheaths of leaves. The leaves are arranged alternately about the stem and are light green in colour, the lower ones ill developed, the upper with lance shaped blades 6 ins. or more in length. Each blade has a well developed central rib and ends in a long point. The flowers are borne in a spike usually produced by a leafless stem, about one foot in height or less. The rhizome which is the spice proper is stout and tuberous with thin leafy skins and it emits fibrous roots. It has a number of buds or sprouts each of which is capable of producing a plant.

CULTIVATION

The plant requires rich, well aerated soil. A tropical climate is essential for its cultivation, but within the wide limits of the term, it appears to thrive almost anywhere provided there is sufficient rainfall and the land is well drained. Ginger is invariably propagated by means of divisions of rhizomes. This is usually cultivated in sandy loams or heavy laterite loams. In the West Coast where it is largely grown and under rainfed conditions, the land is ploughed and prepared when summer showers are received and final preparation is done when soaking showers are received in May. The area is then thrown into raised beds of convenient length with 3 ft. width and with 9 ins. to 1 ft. channels in between to permit easy weeding and drainage. The length of the beds is determined with respect to the gradient of the field, the steeper the level the shorter should be the length of the bed to prevent erosion during the heavy rains. Shallow pits about 2 ins. deep are then made in the beds 9 to 12 ins. apart and a handful or two of powdered cattle manure is applied in each pit. About 10 to 15 cartloads of cattle manure will be required per acre. Seed ginger, cut into small bits of about an inch long with at least one bud in each is put in each pit and covered with soil. The seed rate varies from 800 to 1,200 lb. The beds are then covered with

quick rotting green leaves like Nuxvomica at 4,000 to 8,000 lb. per acre to form a thick mulch. This mulch prevents not only the washing away of the top soil by the beating rains of the south-west monsoon, but also serves as green manure. It also generates by its decomposition sufficient warmth, during the rains for the growing plants. A second mulching is given 30 or 40 days later when the sprouting is complete and a third mulching is given a month later. Weeding the crop and earthing up of the sides of beds are done once a month and usually at the time of mulching. It is necessary that great care should be taken to see that no water stagnates in the beds as otherwise the rhizomes will begin to rot and the crop will ultimately suffer.

The crop comes to harvest during the last week of November to the middle of December, when the leaves begin to wither. The dry leaves and stems are cut and removed from the beds and then the rhizomes are lifted with spades or digging forks. The rhizomes are then cleaned free of roots and soil particles. When the seed material is selected, care should be taken to see that the buds are not injured at the time of cleaning. The ginger finds a ready market for use as green ginger or for despatch to the factories for curing and exporting to the foreign countries. The yield of green ginger is between 8,000 and 20,000 lb. per acre.

The cultivation of ginger at the present time is very profitable. The average cost of cultivation is Rs. 900 per acre and taking the yield at 10,000 lb. per acre valued at Rs. 12 per *thulam* of 37½ lb., the profit works out to Rs. 2,300 per acre.

OBTAINING HIGHER YIELDS

The system of cultivation varies in other parts of India, depending on the climatic conditions of the tract. In the regions of low rainfall, ginger is cultivated under irrigated conditions and the rhizomes are planted on ridges or beds with facilities for easy irrigation and drainage.

As ginger requires fertile soil for its cultivation, the cultivators in Malabar after the harvest of ginger grow paddy followed by gingelly next year and then allow the field to lie fallow for the next one or two years before they cultivate ginger again in that field.

It is observed that so far no systematic work on the improvement of its yield has been done in India or abroad. Malabar cultivates over 10,000 acres of ginger and for tackling some of the outstanding problems in cultivation, preservation and control of the diseases

(*Contd. on page 25*)

SESBANIA AS GREEN MANURE

By **S. R. BALASUBRAMANYAN**

SIR Sivaswamy Ayyar High School, Tirukattupalli, Tanjore district has adopted agriculture as a basic craft for its pupils. Agriculture, gardening, bee-keeping, poultry and dairy farming are the various subjects taught in this course. The managing body of the school got from the Government by alienation a plot of waste land, 30 acres in extent. The land was uneven and was covered with prickly pear, a few *babool* trees and shrubs and sand dunes. The soil was found deficient in both nitrogen and phosphoric acid and contained sodium salts. At a considerable cost the land was reclaimed with a bull dozer.

Within three years the alkalinity of the soil was reduced with the use of farmyard manure and green manure together with a judicious use of chemical fertilizers. Dhaincha was thereafter sown in large quantities and Glyricidia was planted along the bunds of the irrigation and drainage channels. Thus enough of organic matter was produced to meet the requirements of the farm.

At the suggestion of the Minister for Agriculture, Madras the Farm was registered as a Model Farm. This year Sesbania seedlings were planted along the edges of paddy fields at the time of the *Kuruvai* transplantation according to the system followed at the Agricultural Research Station at Aduturai.

Sesbania seedlings grown in the nursery were planted closely on the four sides of the bunds of a plot of about 50 cents. soon after the Kuruvai (first Crop) transplantation. The Kuruvai crop was harvested after about 2½ months. After the harvest, and before Thaladi (second Crop) planting the Sesbania plants were pulled out, stocked on the bunds and later ploughed in before transplantation of the seedlings of the second crop. In about two months' time 2940 lb. of green manure was ready on our 50 cent plot, *i.e.* 5880 lb. per acre. If the roguing spaces were also used for the purpose, much more green manure could have raised.

Sesbania grows quickly, has green leaves in plenty and the seedling never dies. It grows on any soil, and at every spot where a Sesbania plant stood, a small natural nursery is created out of the seeds that the plant sheds. The Director of Agriculture, Madras State, has advocated its extensive use in the whole of the ten million acre area under paddy cultivation in the Madras State. He has expressed confidence that by following this method the production would be stepped up by 10 per cent within a short time and the State would become self-sufficient in respect of foodgrains.

The special benefits of this method are:

(1) The manure is got on the spot at the time it is needed and also in sufficient quantity. The question of buying and carting green manure does not arise.

(2) The manurial value is enhanced by its freshness.

(3) Nitrogen fixation maintains soil fertility.

Sesbania seeds were sown in ten cents in another plot during the fallow period between July and October which produced sufficient green manure for an acre.

Sesbania seedlings have been also planted six feet apart along the margin of the plots of the first crop and second crop area and it is expected that sufficient seeds would be raised not only for home use but also for distribution to the local cultivators. The only difficulty anticipated is that cattle trespass will injure or destroy the plants after the paddy harvest, unless the fields are in a compact area well fenced.

Recent researches in the U. S. A. have proved that the best way to get the maximum good out of superphosphates is to supplement it with plenty of organic matter in the soil; otherwise, the fertilizer is likely to remain as 'dead weight.' So, it need not be emphasised that the more the organic matter is used, the better will be the yield and the best way to enrich our field with organic matter is to spread the use of Sesbania. If this method of enriching the soil is universally adopted, it would go a long way in solving the problem of cereal deficiency in the country.

GINGER CULTIVATION IN MALABAR

(*Contd. from page 23*)

affecting the crop, a scheme was sanctioned by the Indian Council of Agricultural Research and the work was started in 1950-51 season at the Agricultural Research Station, Pattambi. Experiments on the cultural and manurial aspects were taken up with a view to enhancing the yield and treatments of seed material with the fungicides were done to reduce the loss caused by the diseases. Some of the findings recorded during the first year will be of immense use to the cultivator in modifying his method of cultivation to obtain the maximum yield.

There is a belief that the root crops like elephant foot yam give higher yields when bigger sized seed material is used for planting. In potato, at the Agricultural Research Station, Nanjanad, it has been observed, that bigger the size of tubers planted, the higher was the yield but it was economical only upto a certain limit. Four sizes 1 oz., 2 oz., 3 oz. and 4 oz., were used for planting, but 2 oz. gave the best return though 4 oz. gave the highest yield. An experiment was laid out on similar lines with ginger with different seed rates keeping the spacing constant and it was found that greater the seed rate used, the higher was the yield assuring the grower of better profits.

MULCHING

Mulching the ginger beds with green leaves is a very important operation as mentioned already. The ryots mulch the crop thrice during the early stages of growth and it would be a great advantage if it were possible to reduce the number of mulchings which is one of the limiting factors in the general increase of the area due to the non-availability of large quantity of suitable green leaves during May-June. An experiment was laid out to explore the possibility of reducing the number of mulchings to one or two instead of the usual three. It was seen that the yields were affected when the number of mulchings was restricted.

MANURING

Manuring is an important item in crop production and it is agreed that ginger requires a fertile soil. But no work on the manurial requirement of this crop has been done anywhere; but it is seen, however, that oil cake or cowdung is used in Bengal, bone dust in Queensland and soluble phosphates of ammonium and potassium in Jamaica while in Malabār powdered cattle manure is applied alone and sometimes mixed with wood ash.

Under the scheme an experiment was laid out to observe the response to nitrogen and phosphoric acid alone and in combination. Nitrogen at 50 lb. and 100 lb. as ammonium sulphate and phosphoric acid at 45 lb. and 90 lb. per acre as superphosphate were applied alone and in combination. Though the results were not statistically significant the figures indicate higher yields with higher dose of nitrogen and 100 lb. of nitrogen gave the best yield and was also profitable but no increased yield was indicated with phosphoric acid alone or in combination.

DISEASES

It has been observed that at the time of harvest a good percentage of rhizomes was found to have got damaged by diseases. Often the growing plants were seen to wither and die at different stages of growth. The damage was observed to be mostly due to Pythium species and the Agricultural Department is advocating the use of 0.05 per cent mercuric chloride for treating the rhizomes before storing as seed as well as at the time of planting. The fungicide was found to check the disease to a great extent but still the disease was observed to appear sometimes in a mild form in spite of the treatment. An experiment was conducted with several other fungicides to get at the best one for treating the seed before planting. The results indicated that colloidal copper and chestnut compound were promising.

PESTS

Serious pests were not observed on this crop. Turmeric shoot borer was found to cause some damage but this could be effectively controlled by collecting the dead hearts and destroying and at the same time spraying 0.25 per cent Guesarol twice or thrice at weekly intervals.

STORING OF SEEDS

The preservation of seed material is in no way less important than the actual cultivation of ginger. By faulty storing the seed material very often rots and sometimes the whole stock is lost. The ryots usually store the seemingly healthy rhizomes in a big pit dug in a cool place inside some shed. The mouth of the pit is closed with a plank with a hole through which a tube like hollow bamboo is inserted to permit communication with the atmosphere to allow aeration to the rhizomes. The plank is then covered with mud leaving the bamboo tube projecting out.

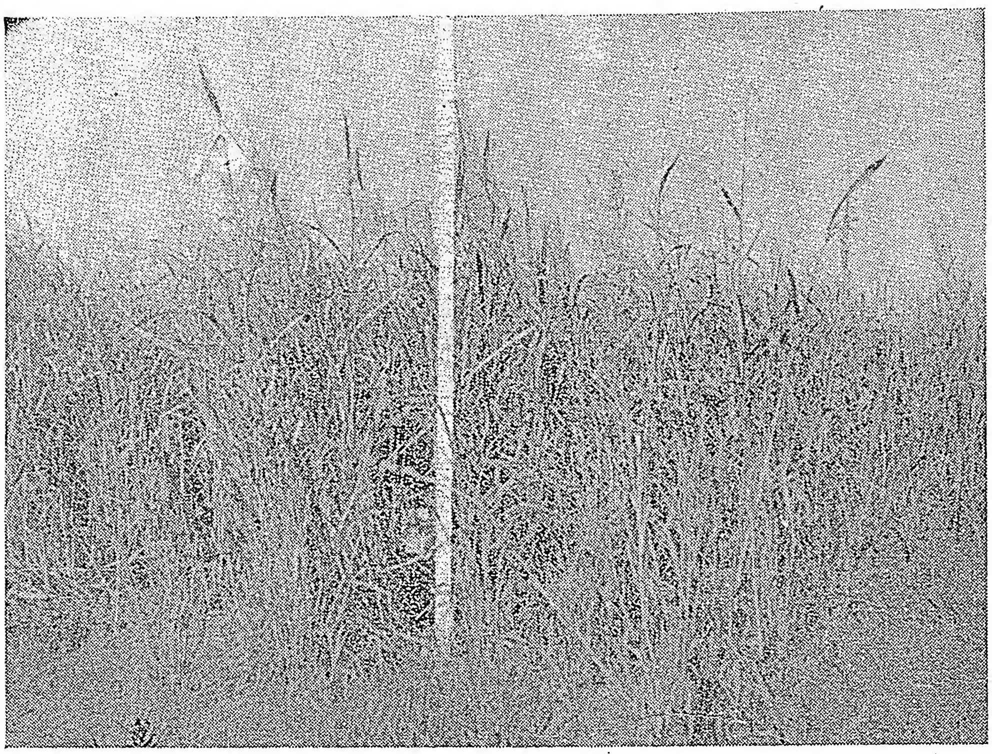
Adopting the ryots' technique the seeds were stored after treating for different periods with mercuric chloride solution and Ceresan of different concentrations. It was observed that treatment where the rhizomes were soaked in 0.25 per cent Ceresan for 30 minutes before storing was the best followed by mercuric chloride 0.1 per cent soaked for 45 minutes and 1½ hours.

A trial was made to preserve the seed in the land itself without harvesting the crop. A small portion of the field was set apart for the investigation and one half of the area was left unmulched while the other half was given a heavy mulching with dry leaves. The rhizomes were dug at the time of planting and it was found that the mulched area gave 5,850 lb. of rhizomes per acre while the other gave only 900 lb. It is seen that there is a possibility of preserving the seed material in the field also.

Adopting all the improved methods of cultivation and preservation mentioned above it should be possible for a Malabar cultivator to increase his margin of profit to a considerable extent.

SUDANGRASS—A NEW FORAGE

By
H. C. MALIK
Fodder Botanist,
Sirsa



Sudan grass 1952

THE proper feeding of farm animals both drought and milch, alone can help improve the standard of cultivation and milk supply in our country. Growing of fodder crops though common in the dry irrigated areas of the Punjab, is seldom undertaken in the areas naturally favoured with sufficient rainfall. Cattle in such areas depend upon the by-products of food crops supplemented by whatever green roughage they can pick up in the village grazing lands. But unless cattle are ensured adequate feed, all efforts to maintain them in good condition and to improve them will not achieve the desired results. In view of this it is imperative that cattle must be provided with enough feed.

Though there are a number of fodder crops which are at present grown in the Punjab State yet Sudangrass is a valuable addition in view of the fact that it grows much better than *jowar* or maize in the early hot and dry summer months of April-May-June. It is an excellent quick growing grass which can be cultivated with great advantage for providing large quantities of green stuff. If the crop is allowed to grow three to four cuttings during the season are easily obtained according to the fertility of the soil and availability of moisture. The crop sown in the end of March is ready for the first cutting in about 50 to 55 days and subsequent cuttings can be taken in 35 to 40 days.

Like other sorghums, sudangrass prefers warm summer climate of relatively low humidity and is sensitive to frost. The growing season is, therefore, limited to the warmer months of the year.

Sudangrass is a grassy counterpart of the ordinary sorghum (*jowar*). Unlike *baru* (Sorghum halepense), Sudangrass has no rootstocks and does not become a weed in cultivated lands. It is an erect growing plant that reaches a height of more than 6 ft. under ordinary conditions. The stems are non-sweet, solid and much thinner than the thin stalked sorghums.

Though the crop is preferred as green fodder, its dry stalks after seed ripening can be stored like sorghum *karbi*. The crop on an average yields 400 to 600 maunds of green stuff per acre.

Since its growth is much superior to *jowar* and maize in the dry and hot months, it is primarily recommended for this period. It is cultivated like other sorghums in a well prepared moist soil either by *kera*—dropping the seed in the furrow behind the plough or by broadcasting and covering the seed by *sohaga* (plank of wood). Ten to twelve seers of seed is required to sow an acre. It can be sown at any time after the soil becomes warm in spring, i.e. from the middle of March onwards up to the beginning of July.

Experiments were carried out to study the influence of fertilizers, irrigation and intervals between two successive cuttings on the forage yield of crop. They revealed that high doze of farmyard manure, say, about 28 tons per acre, with high level of irrigation each after 7 to 10 days with 40 to 50 days cutting intervals gave

the maximum forage returns. The summary of the results is given below :—

Treatment	*Level*	*Yield of forage per acre*
		(in maunds)
Farmyard manure	28 tons	814.7
	14 ,,	767.5
	Control	695.0
Irrigation	High (after 1 week)	739.0
	Medium (after 2 weeks)	684.0
	Low (after 3 weeks)	632.0
Cutting intervals	30 days	575.6
	40 ,,	723.5
	50 ,,	754.1

Sudangrass is grown for raising seed in the month of July along with sorghums for seed production. The crop starts earing in the end of September and ripens seed in October-November. The crop on ripening is cut and collected in small bundles. Ears are then separated by cutting them from the stalks and threshed by bullocks. Yield of seed varies from 3 to 5 maunds per acre.

If the field is not ploughed and ratoon crop is allowed to sprout in spring, i.e. February, it enables another crop of seed to be obtained from which 2 to 4 maunds per acre of first quality seed can be secured.

Efforts are being made to evolve superior high yielding strains from the existing stock as well as to make the stem sweet and juicy. Accordingly, a number of strains have been isolated from sudangrass sorghum hybrids. The desirable strains are under trial.

TOMATOES IN METROPOLIS

(*Contd. from page 11*)

'Meeruti' type having the characteristic shape, size, and colour. One would commonly observe that, at the vegetable shops, the fruits of this variety are usually exhibited with their deep red bottoms facing upwards; the stem-end is usually green and unattractive and hence the shopkeeper conceals this. The winter supply receives a set-back if there is early frost any time between 15 December and 15 January. In frost-free winters, the autumn-winter crop extends up to about the middle of February.

Spring supply : It has been interesting to note that the produce of Moradabad in U. P. is rather inferior, the fruits being irregular and fasciated, though large in size. The keeping quality is also poor. Whether this characteristic irregular shape is due to the inferior variety grown or it is the soil and the climate of the place which are responsible, is not quite clear. Since this has been observed, year after year, it is possible that it may be partly due to the place effect. It would be interesting to try here a few varieties which are otherwise known to produce good, shapely, fruits. Ahmedabad and Mehsana export a "plum" type of tomato of good red colour which, though small i- sells at par with the large-sized fruits. for

(*Co*

SEWARGAON-DUKRE THE VILLAGE WITH A PURPOSE — — (*Contd. from page 17*)

The village dispensary, the community receiving set, the library and the reading room are housed in the building of the "Samaj Vikas Kendra" which was opened by Dr. Panjabrao Deshmukh last year. Neatly stacked in a corner of the building were a number of bags of *jowar*. I was told they were the house-to-house collections made by the youngmen of the village, for seed purposes. The sale proceeds would go to swell the village fund, to be used for schemes of common welfare. Attached to the village temple are 25 acres of land which are leased out. The income from the land is used to finance agricultural operations at a low rate of interest.

And from the common fund of the village, the inhabitants have laid out 1,000 ft. of granite drainage, set up 14 street lamps, 8 dustbins, several urinals and latrines. The refuse from the last two is converted into valuable compost to fertilise the fields.

SOCIAL ACTIVITIES

Sewargaon-Dukre once had a well-established hand spinning and weaving centre, which the country's alien rulers succeeded in disorganising during the days of the Civil Disobedience Movement. Undeterred however by the persecution of the authorities, the inhabitants launched a new programme of social uplift. Its first item was prohibition and the abolition of untouchability; the second, elimination of illiteracy and the ruthless cutting down of extravagant expenditure. Shri Santosh Rao Patil told me that his father's weakness for drink was a byword in the village. It was decided therefore that he had first to be reformed. The struggle was hard and often bitter, but once the old man was won over to the new gospel, victory came quicker to the reformers.

Expenses on marriages, funerals and other ceremonial occasions have been cut down to the barest minimum and to sustain the spirit of unity, much greater prominence is given to the national rather than to the religious festivals.

The village runs a debating society holds adult literacy classes both for men and women, and maintains a village band, which would be the envy of many a small Indian town.

Many things still need to be done at Sewargaon-Dukre. In the words of Santosh Rao Patil, the village needs immediately at least four community latrines, a training center "Bal Mandir" for the tiny tots, and a three-mile pucca road to Chikhli. These are some of the things that need to be done, but nonetheless a significant experiment is taking place in this small village in the heart of India. No development in rural welfare can be exactly duplicated. The problems requiring attention, the social environments out of which they arise, the personnel and resources available differ from region to region. Nevertheless what has been achieved in one village may provide stimulus and guidance in others which have broadly similar problems.

There seems no doubt that the courage and devotion of the inhabitants of Sewargaon-Dukre have cleared the ground for future development if more support—moral and material—is forthcoming.

TOMATOES IN METROPOLIS — — — — (*Contd. from page 27*)

HOW OFF-SEASON SUPPLIES ARE POSSIBLE

The tomato, like several other vegetables, is exacting in its requirements of climatic conditions for proper growth as well as fruiting. As such its cultivation is governed by the limitations imposed by seasonal changes. Favourable seasons occur almost all the year round in one part or the other within the country. It has been shown by various research workers that the tomato is particularly sensitive to differences in night temperature and the day temperature may vary within wider ranges without affecting its growth and production. Further, the night temperature 'response' is dependent on the age or size of the plant, and also the variety. With temperatures considerably lower than the optimum range, the growth of the plant as a whole receives a set-back; on the other hand at high temperatures, while the growth continues, the blossom drop increases and the fruit-set is lowered.

The rainy season supply received from the hills is the harvest from the crop transplanted in spring, i.e., during March-April. The temperature there is favourable for the growth and fruiting, during May and June, and these fruits ripen from mid-June onwards. The ... mainly from Ai... for the ... that tom... onth...

the two places are not appreciably different. So far as the variety is concerned, it has been observed that

cutting in about 50 ... subsequent cuttings can be taken in 35 to ...

Like other sorghums, sudangrass prefers warm summer climate of relatively low humidity and is sensi-

... reveal... 28 tons per ... 7 to 10 days with...

the Ajmer varieties behave like other varieties when grown at Delhi and there is no early ripening. Possibly this behaviour may be attributed to the difference in altitude and comparatively lower temperatures prevailing in Ajmer during July and August in which period growth and fruiting take place. With the commencement of supplies from Kotah, supplies from Ajmer diminish and finally both these sources stop, owing to the competition with the local produce and that from Meerut and Hapur.

The spring supply is made possible by the almost frost-free winter at Fyzabad, Allahabad, Patna and Ahmedabad and comparatively milder winter at Moradabad. Here transplanting is usually done during November-December and unlike at Delhi, the tomato plants start growth from the very beginning. At Delhi, the December-transplanted crop remains almost stationary till the weather warms up in February.

QUALITY TOMATOES FOR THE METROPOLIS

The "metropolitan" is quality-minded, though a large section would be satisfied with the "second quality" fruit provided these can be had cheaply. The city-dweller can obviously benefit if good quality tomatoes are produced at the places which export tomatoes to Delhi. This can be possible if seeds of good varieties, suitable for cultivation at these places, can be supplied to the cultivators. Generally, most of the cultivators purchase fresh seed every year, though some of them keep their own seed but without making any judicious selection. The result is that the produce lacks uniformity in size, shape and colour of the fruit. In the Division of Botany at the Indian Agricultural Research Institute, collections of tomatoes made from the fields of the cultivators at various places and also collected from time to time from the consignments booked for Delhi, have been studied and compared amongst themselves and with the foreign varieties, with a view to finding out superior substitutes, if possible. The more promising varieties are also being given a trial at various places. It is hoped that as this work progresses, the Delhi market can expect to find some really good tomatoes in the market.

SUPERIOR VARIETIES AVAILABLE

As a result of the trial of large collections, it is now possible to recommend suitable varieties. The American variety 'Sioux' is one such variety the cultivation of which has been found profitable in Delhi State and its neighbourhood. It gives high yields of good, large-sized fruits of superior quality. It is suitable for planting for both the autumn-winter and the spring-summer crops. Another variety, ripening slightly later than 'Sioux', is 'Prosperity'. It produces medium-sized round fruits, usually in good-sized clusters. For extending the fruiting period of the summer crop, heat-tolerant varieties, viz., 'Pearson' and 'Devlins Choice', are recommended. These can be planted in the first week of March. Pure genuine seeds of these varieties can be had, in small quantities, from the Head of the Division of Botany, Indian Agricultural Research Institute, New Delhi. The Institute has also produced a small-fruited red variety with a luscious sweet flavour and high vitamin C content for discerning growers interested in growing quality tomatoes for juice production or for eating raw.

SUGARCANE AND OATS SILAGE - (Contd. from page 19)

than in *jowar* silage, which is easily digested by the cattle. Moreover the food units are more in sugarcane and oats silage than in *jowar* silage. So sugarcane and oats silage compares very favourably with *jowar* silage.

COST OF ENSILING

The following quantities of sugarcane and oats silage were ensiled:

		Quantity filled (maunds)	Quantity fed (maunds)	Percentage loss
Silo tower	Sugarcane & Oats	5627.5	5170	8.12
Masonry silo-pit	do.	1541.75	1409	8.57
	Total	7169.25	6579	8.23

The cost of ensiling (in rupees) may be calculated as under :—

	Rs.	a.	Rs.	a.
Carting	222	8		
Filling and chopping	210	4	455	8
Covering	22	12		
Steam coal	220	0	240	6
Other items such as machinery, upkeep, etc.	20	6		
Pay of one driver for 22 days	58	0	105	0
Pay of one boilerman for 22 days	47	0		
Cost of 4419.25 md. of sugarcane at As. 14 per maund	3,866	14	5,671	14
Cost of 3610 md. of green oats at As. 8 per maund	1,805	0		
Total			6,472	12

The percentage loss in a silo tower ranges from 8 to 15 per cent and if the fodder is well preserved and enough water is added the loss does not exceed 10 per cent. The loss in sugarcane and oats silage came to about 9 per cent. The cost of 6579 maunds of sugarcane and oats silage came to Rs. 6472-12-0, i.e. As. 15-9 per maund.

Considering the minimum cost of preserving green fodder with sufficient succulence and nutritive value, the ensiling of sugarcane with green oats is of very great economic value in our dairy industry. The above data indicate that a maund of this highly nutritious and succulent fodder can be had at a very low cost of about one rupee per maund, and at the same time the surplus of sugarcane can be utilized with advantage as a preserved fodder for dairy cattle.

WHY PRACTISE MIXED FARMING? - (Contd. from page 21)

ADVANTAGES OF MIXED FARMING

The above results have conclusively proved that mixed farming has several advantages :—

(1) The cultivator and his family find an extra remunerative employment in their homestead. The idle time is usefully spent in the subsidiary occupation of tending the cattle and production of fodder and feeds. The demoralizing influence of idleness on the family members is avoided.

(2) The fertility of the land improves by extra manuring and production of leguminous and other fodders for the cattle. This reduces the necessity of fallowing the land to recuperate the soil.

(3) Intensive use of land is brought about by adopting intensive cropping to meet the fodder and feed requirements of the cattle and domestic requirements of grains, vegetables, etc.

(4) The by-products of crop husbandry are more profitably consumed by animals to produce milk, which is the chief protective food for most vegetarian families in India.

(5) In the monsoon season natural growth of local grasses provides useful forage for the animals when maintained on the farm. This forage otherwise is sometimes not weeded out, which contributes to the lowering of crop yields and the forage goes to waste.

(6) When prices of grains are low and it pays less and less for work on the farm, the subsidiary occupation supports the family in time of stress. In the unirrigated tracts milk production provides support to the family, when rains fail and crop yields are low.

(7) The farmer is able to raise his draught animals on the farm and has not to invest capital from his pocket. The dry stock is usually maintained on the fodder and the forage available on the farm.

In the final analysis the system of mixed farming is positively more remunerative per acre of land, per family member and per pair of bullocks. Many of the farmers at present are following a system of farming which is extensive in nature and involves much waste of labour, land and capital.

HOLDING SIZE

The economical size of a holding for purposes of mixed farming depends upon several factors, namely, nearness of market, availability of irrigation or assured supply of rainfall throughout or greater part of the year, the general environmental conditions, the physical nature of the soil, its fertility status, etc. It has been found that the minimum size of the holding would be 8-10 acres near the towns in northern India. In the rural areas the minimum size of the holding which has the capability of maintaining a family, working for a frugal living, would be about 12-15 acres. If the rainfall is below 25 inches but is quite assured, the size of the holding would be in the neighbourhood of 25 acres. In southern India "wet land" holdings should have a size of 5 to 7½ acres, and dry land holdings varying from 15 to 25 acres, depending upon the location within the North-East and South-East monsoon belts or within the deltas of rivers. Such holdings would have the capability of maintaining frugally a family consisting of five members, three adults and two minors, one pair of bullocks, one cow, one buffalo and two young stock.

HINTS FOR SUCCESS

For success in mixed farming the farmer should attend to the following:

(1) The cropping scheme should be so designed as to meet the cereal, pulse, fodder, feed and cash requirements of the farmer. The proportion of legume crops should be high to reduce the bill for nitrogenous manuring and feeds for cattle.

(2) For meeting fodder requirements throughout the year the farmer should set apart a small plot of land for permanent grasses. He should prepare hay and silage to tide over scarcity periods. Catch crops for fodder should be raised as intercrops or short duration crops between the *kharif* and *rabi* seasons.

(3) Phosphate manuring of legumes should be taken up, for every lb. of phosphorus applied to legume enables these crops to fix 3 lb. of nitrogen in the soil.

(4) About 20 per cent of the area of the holding should be devoted to cash crops to meet cash requirements of the family.

(5) Varieties of fodder, feed, cereal and cash crops grown on the holding should be those recommended by the State Department of Agriculture.

(6) The farmer should maintain animals of good dual purpose breed capable of yielding large quantity of milk with a small dry period. The pair of bullocks should be strong and sturdy and should be kept employed for over 250 days in a year.

(7) The timeliness of operations of sowing, cultivation, harvesting, judicious use of irrigation water, practices to conserve soil moisture, intensive fallow cultivation, application of well rotted farmyard manure 8-10 weeks in advance of sowing, intensive use of fertilizers, etc. are other factors which make for success in mixed farming.

(8) Special emphasis must be laid on the conservation of dung, urine and waste from the field and trough. All night soil and urine should be composted for use at the farm. Above all the will to improve farming and effective use of factors of production depends upon the farmer. His initiative and industry will determine the degree of success in mixed farming.

SEASONAL PESTS OF CROPS:

(Contd. from page 9)

HIEROGLYPHUS NIGROREPLETUS

The pest has been reported from Bombay, Madras, Madhya Pradesh, Bihar, Uttar Pradesh and Ajmer-Merwara. Within recent years it has been observed to be doing extensive damage to Kharif crops in Ajmer-Merwara and the adjoining States. In the south the pest has been observed causing serious damage in Nellore (Madras) only. It has also been observed in some villages in the Delhi State. Likewise it is present in other areas of the Indian Union but only as a minor pest. It is therefore necessary that a careful watch is kept about its activity lest it might not suddenly become a major pest in these new localities. Fortunately the pest as is commonly met with is short-winged and unable to fly long distances and occurs in the same place year after year. So it is easy to plan control operations well before hand. The pest has only one generation in a year and therefore with proper planning it is possible to achieve a measure of success in its control. The hoppers live on grasses that grow near and around the fields but as soon as maize and *jowar* as well as *bajra* come in the field they immediately migrate to these crops. It is, however, the nymphs that do more damage than the adults. In the beginning of the season the nymphs attack only maize and *jowar* but later they divert their attention to Til and Moong also. When the crop is young the hoppers feed on leaves only but later in the season when it develops grains the hoppers attack the ears also. The plant growth is generally arrested and an appreciable quantity of valuable food for men and fodder for cattle lost.

Adults mate more than once and the female lays eggs also more than once. Eggs are invariably laid under the soil on sides of bunds or raised grounds at a depth of 3-4 ins. and very rarely in the cultivated fields. Eggs are laid in small cylindrically shaped pods and one female has been observed to lay as many as six such pods under laboratory conditions. In each pod there are about 50 to 60 tiny yellow coloured eggs. In the field we actually come across two distinct types of eggs, one freshly laid and the other 1 to 4 or even 5 years old. Compared to the old eggs, the fresh ones are a little smaller in size, not completely covered with mud and also softer in texture. The pest enters diapause in the egg stage by September and it is not until July-August next year when a few showers have fallen on the ground that these eggs start hatching. The small green hoppers just after coming out of the egg shells immediately start feeding and in the absence of maize, *jowar* or *bajra* they feed on grasses and later move on to these crops when they come up. The nymphs just after hatching feed a bit slowly and the damage is not so conspicuous but as they grow to maturity they become voracious eaters and the damage caused is very severe. The nymphal period usually covers from 60 to 82 days, the period being always less for those that hatch and thrive during July-August. The adults formed during September have been found to live from 33 to 81 days under different ecological conditions. Eggs are laid by the end of September or the beginning of October. The whole life-cycle covers from 105 to 152 days depending on the prevailing temperature and humidity conditions.

CONTROL MEASURES

In the case of *Hieroglyphus* the climatic complex of temperature, humidity and rainfall vitally govern the activity of the pest in the field. Serious damage to the crop is oftentimes caused only in those years of good and regular rainfall. If in any year there are early rains followed by periods of drought, the pest usually fails to thrive well for the simple reason that the nymphs that hatch out immediately fall a victim to the prevailing drought conditions and perish. Not only the nymphs but a large number of eggs under soil are also found to be adversely affected due to this drought and degenerate on account of high soil temperature. If, however, the rains are regular and timely the pest gets the upper hand. The following control measures may be applied in the field to subjugate this pest:

(1) Destruction of eggs by deep ploughing after the crop is harvested.

(2) Poison baiting of hoppers when they are young with the following formulations:—

Bran	80-100 lb.
Sodium fluosilicate	2 ,,
Molasses	2 ,,
Water	Add as required

(3) Dusting the hoppers with 5 per cent BHC at the rate of 10-20 lb. per acre. The operation is to be concentrated more in the early stages when the hoppers generally feed on grasses on the bunds. Dusting on the fodder crop or on crop meant for human consumption should be done with great caution and under expert supervision.

Supplement to

INDIAN FARMING

July 1953 *Volume III* *No. 4*

What the Krishi Pandits did to obtain high yields

1952

INDIAN COUNCIL OF AGRICULTURAL RESEARCH
NEW DELHI

Sl
H

B
B
M
h
si
A
S
b
ir
a
ir
p
U
is
w
it
n
F
r
t
t
i
v
c
t
I
s
l
a
a

PADDY

Winner : Shri Jangama C. Sangayya, Village Alur, P. O. Sommarpet, Coorg

Yield : 11,202 lb. 136 mond 25 seer. 140 maund.

Size of plot : One acre

Situation, previous crop, etc. : The plot was situated at a low level and received adequate irrigation from a tank in the absence of rain

Nature of soil : The soil was sandy loam and of black colour

Manuring : Compost manure—10 cartloads (about 10,000 lb.) per acre

Bone-meal — ½ bag (112 lb.) per acre

Green leaf — 2,500 lb. per acre

Culture : One-month old seedlings were transplanted after puddling the field with a country plough

Five to six seedlings per bunch were used in transplanting

WHEAT

Winner : Shri Gurdev Singh, National Model Farm, Village Kalalmajra, Tehsil Samrala, District Ludhiana, Punjab

Yield : 5,890 lb. 71 mond 34 seer.

Strain : Wheat C-518

Size of plot : One acre

Situation, previous crop etc. : The field was under vegetables for two years and was heavily manured

Manuring : Farmyard manure, 375 maunds (about 30,875 lb.) equal to about 30 cartloads, was applied per acre at the end of August. Ammonium sulphate at 1½ maunds (about 24 lb.) per acre was applied in the month of January, 1952

Culture : The land was ploughed 15 times before sowing and three ploughings were given after *rauni* irrigation, *i.e.*, pre-sowing irrigation to bring about optimum conditions of soil moisture

Seed rate was 35 seers (about 72 lb.) per acre

Sowing was done with a single row cotton seed drill with a distance of 6-7 inches between nows.

Two hoeings were given after the first and second irrigations

POTATO

Winner : Shri Jaipal Chandra, Bulandshahr, Uttar Predesh

Yield : 60,525 lb. per acre 738 2½

Size of plot : Half an acre

Strain : Darjeeling Red

Situation, previous crop, etc. : The land was well drained and mainly irrigated from a tube-well

The field was left fallow after harvesting the crop in 1951

Nature of soil : Loamy

Manuring : In the last week of June, 1951, sann-hemp was sown in the field and after 1½ months, *pata* (wooden plank) was run over the field to which bone-meal at the rate of 30 maunds (2,460 lb.) per acre was applied. Sann-hemp crop was buried by ploughing the field with a Victory plough

After sann-hemp had rotted, ploughing was done every third day and after

each ploughing *pata* (wooden plank) was run over the field

In the last week of September, compost manure at 1,400 maunds (about 115,200 lb.) equal to 115 cartloads per acre, was applied and incorporated into the soil by ploughing the field

The following dose of fertilizer mixture was applied per acre three or four days before sowing :—

Superphosphate — 20 md. 30 sr. (1,720 lb.)

Ammonium sulphate — 2 md. (160 lb.)

10 : 10 DCM Chemical Works Mixture — 3 md. (250 lb.)

9 : 6 DCM Mixture — 5 md. (412 lb.)

Castor cake — 20 md. (1,650 lb.)

The dose indicated above was also applied at the time of hoeing

Seed rate : $17\frac{1}{2}$ maunds (about 1,440 lb.) per acre

Culture : On 28 October, light irrigation was given and thereafter irrigation was applied whenever required

Two hœings were given at intervals of a fortnight after sowing and the manure mixture was spread in the field

On 16 January, 1952, a mixture of cowdung and potassium sulphate was given through irrigation water

To protect the crop from insect pests and diseases five sprayings of Perenox were given

The crop was harvested on April 6, 1952

GRAM

Winner : Shri Walaiti Ram Lambardar, Village Agwar Khaj Bajir, P. O. Jagraon, District Ludhiana, Punjab

Yield : 3,788 lb. 46 mds. 8 srs.

Size of plot : One acre

Situation, previous crop, etc. : The plot was a *barani* (rain-fed) land which did not contain sufficient moisture

It was ploughed deep and a heavy *sohaga* (or wooden plank) with additional weight on it was used to break clods after each ploughing

In this way moisture from lower layers of the soil was brought up

Seed rate was 48 lb. per acre

No irrigation was applied

Nature of soil : Loamy

JOWAR (Sorghum)

Winner : Shri Bhimgonda Dada Patel, Village Tamadalge, Taluka Shirol, District Kolhapur, Bombay State

Yield : 6,989 lb. per acre 85

Size of plot : Three acres

Situation, previous crop, etc. : The crop was grown in the *kharif* season and no irrigation was applied

The seed was dibbled and before dibbling, was treated with sulphur as a preventive of smut disease

Culture : Ten hoeings and eight weedings were given to the crop and the plants were earthed up at the time of last weeding

BAJRA (Pearl Millet)

Winner : Shri Waman Ramchandra Marathe, Village Arthe B. K., Taluka Shirpur, District West Khandesh, Bombay State

Yield : 2,410 lb. per acre

Size of plot : Three acres

Strain : Akola *bajri*

Situation, previous crop, etc. : The crop was not irrigated

Bulky manure and ammonium sulphate were applied to the crop

Note : "The facts and procedures mentioned in this supplement were reported by the Krishi Pandits. The Indian Council of Agricultural Research does not take any responsibility as to the correctness of these."

INDIAN FARMING

Vol. III New Series No. 4 July 1953

EDITOR'S PAGE AND EDITORIAL NOTES 2

MAN OF THE MONTH (Feature Article)—H. M. Desai 4

FRUIT FLY PESTS OF ORCHARDS AND KITCHEN GARDENS —E. S. Narayanan 8

LEATHER BEETLE (Dermestes Vulpinus) IN INDIA—B. N. Soni .. 12

THRESHING WHEAT BY A TRACTOR AND DISC HARROW —R. V. Ramiah 14

CASHEWNUT—A DOLLAR EARNING CROP OF INDIA —U. Narasinga Rao and V. N. Madhava Rao 16

PEPSU'S YOUNG FARMERS—A PROMISE FOR THE COUNTRY —Amrik Singh Cheema 18

FOOD PROBLEM OF CATTLE IN ASSAM—H. N. Dev Goswami .. 22

EDITORIAL BOARD

PRINTED AND PUBLISHED BY P. H. RAMAN AT THE ASSOCIATED ADVERTISERS AND PRINTERS LTD., 505, ARTHUR ROAD, TARDEO, BOMBAY 7, (AGENTS FOR INDIAN COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI.)

ADVERTISEMENT RATES

CURRENT:
CASUAL

Full Page	Rs. 450/-
1/2 Page	Rs. 225/-
1/3 Page	Rs. 150/-

CONTRACT 6 INSERTIONS	CONCESSIONS: 12 INSERTIONS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

Effective from October 1952 until further notice.

SUBSCRIPTION RATES

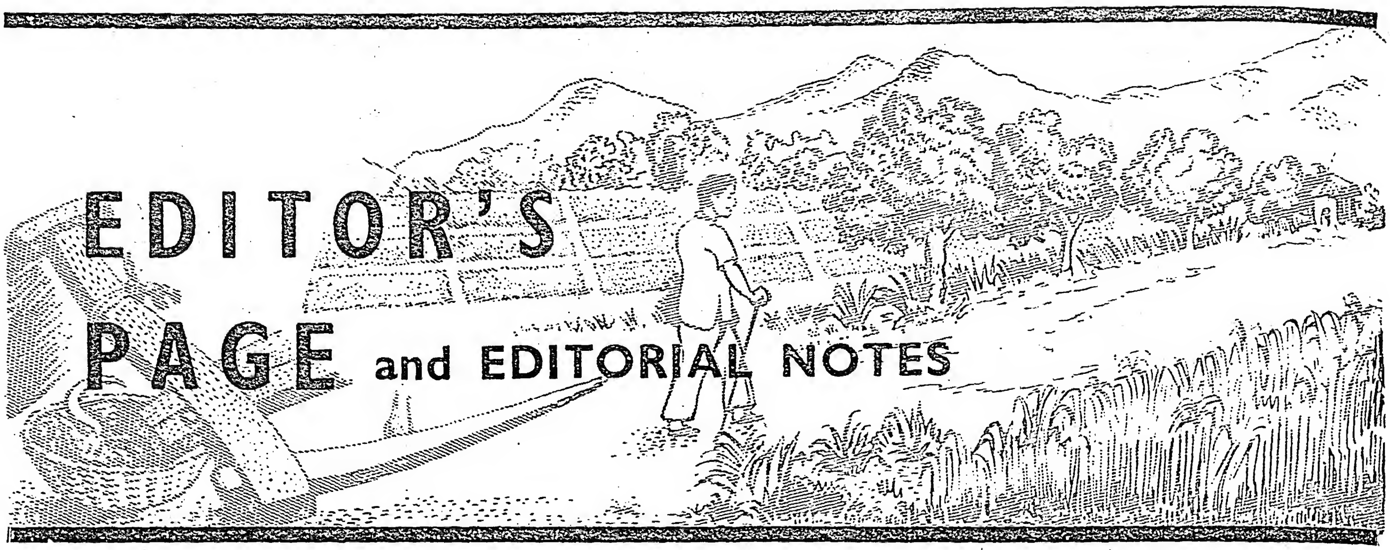
Annas 12 only per copy

Rs. 9-0-0 for 12 issues

Rs. 4-8-0 for 6 issues

★

All Business enquiries may be addressed to the "Agents" at 505, Arthur Road, Tardeo, Bombay 7.



The problems relating to horticulture were discussed recently in a meeting, specially called by the Indian Council of Agricultural Research. Dr. Punjabrao Deshmukh, Union Minister for Agriculture presided over the meeting which was attended among others by horticultural specialists, both official and non-official. All aspects of horticultural research and development were discussed at this conference.

Horticultural development is of special interest in India because of the dietary habits of people in this country which are primarily vegetarian. It is, therefore, in the fitness of things that orcharding in India should be raised from its neglected position to the level warranted by modern research and development. It is not that knowledge and research are wanting in these respects, nor is it that marketing conditions have not been studied at all. The data and information are available; may be that they do not cover all fruits and vegetables or all aspects of horticulture. But it cannot be confidently said that knowledge and results of research as are available have been made use of to the best advantage.

The time has come when it should be increasingly realised that chief importance of horticulture lies in the betterment of nutrition of the people of this country. People need fruits and vegetables in their daily diet, not as a matter of luxury but of necessity. Because of this, horticultural development should be looked upon as of national importance. The production of fruits and vegetables should, therefore, possibly be viewed from the same angle as the production of foodgrains.

It is true that for proper development of horticulture, research has to be undertaken. It is truer, however, that research will be meaningless unless the useful results of research are adopted and applied in the fields. Such results should, therefore, be conveyed to orchard owners and they should be convinced of the benefits resulting from their adoption of them.

It is necessary that the villager should be encouraged to produce fruits and vegetables in his home in much the same way, as the move to have kitchen gardens attached to residential quarters in urban areas has been supported. The small-scale producer should receive careful attention. However, in view of the area and population of this country and because of the variety of fruits and vegetables, commercial gardening should have great possibilities here. Of special importance in this connection is the handling of surplus produce during the season. If the surplus produce instead of being wasted could be processed so as to be available throughout the year, it would be of great benefit not only to the producers but to the consumers as well. Moreover, if this was ensured the producers would get better economic returns and the resulting incentive will lead to better production. The highly mechanised type of canning practised in organized industries is no doubt of consequence; not less so is the preservation of fruits and vegetables by small-scale producers and by the housewife.

The Conference thought that a senior officer at the Centre should be responsible for the development of

horticulture and coordination of horticultural work throughout the country. Another important decision was the appointment of a small committee entrusted with the task of reviewing horticultural work done in the past and to suggest lines on which the future work should be undertaken. The Committee recommended the setting up of a horticultural section at the Indian Agricultural Research Institute. It was also suggested that loans should be made available from the Grow More Food funds for horticultural development schemes. The difficulty of procuring seeds of the requisite type was pointed out and this was considered to be an obstacle in the successful working of horticultural development programmes. It was suggested that arrangements should be made for supply of certain selected types of vegetable seeds to the villagers for encouraging production of vegetables. The Conference also recommended that fruit preservation should be included in the curriculum of village level workers in the Community Project Areas so that they could teach methods of fruit preservation in rural areas. The recommendations if implemented will no doubt raise the status of horticulture in this country.

* * * *

The fourth Vana Mahotsava celebration began on July 1, 1953. It is gratifying to see that Vana Mahotsava is fast becoming a national festival in this country. Much enthusiasm has been evinced in the past years all over the country in planting trees during the period of this celebration.

The Union Minister of Agriculture, Dr. Punjabrao Deshmukh has specially recommended *babul* (*Acacia arabica*) for the Vana Mahotsava this year. Says he, 'the tree is exceedingly thrifty in respect of its requirements and is, therefore, ubiquitous throughout India.' He has, therefore, suggested raising of *babul* trees on waste lands, *nala* banks, road and railway lands, grazing grounds and above all, in ravines and undulating broken lands unfit for cultivation.

Two more species of plants have also been recommended—bamboo and cane, provided they do not come in the way of high priority accorded to the *babul*. The bamboo and cane could be raised at little cost and have immense possibilities for use in cottage industries.

It is expected that the celebration this year will be as successful as in the past, if not more.

MAN OF THE MONTH

Hardy Farmer

MAKES VEGETABLE FARM PAY DIVIDENDS

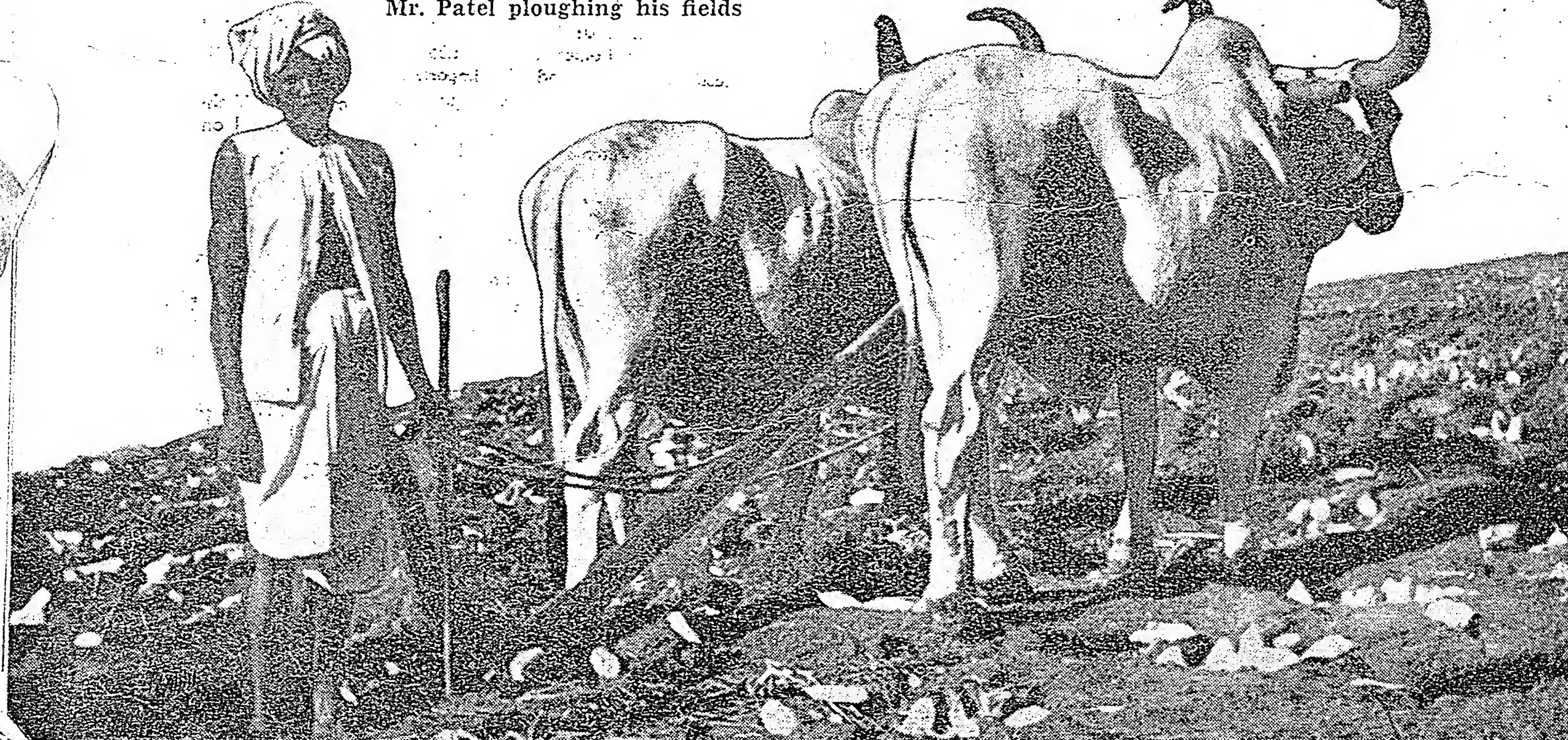
By HIRALAL M. DESAI

MATHURBHAI Ramdas Patel affords an example of the the characteristic hardy and intelligent farmers of Kaira district and the Charotar tract of Bombay State.

Farmers from the neighbouring villages and merchants from even far off towns go to Boriavi village in Anand Taluka in the district to see Mathurbhai's vegetable farm, easily one of the best run in the tract. Mathurbhai by dint of his hard work and intelligent application of farming principles has made vegetable growing one of the most lucrative professions, and in the course of a few years, raised himself to the standard of a progressive farmer with more feathers to his cap than any farmer in the area can boast of.

The farm is situated in the Charotar tract of the Kaira district. The soil of the tract is *goradu* (a fine sandy loam). This soil is of alluvial origin, very deep and very well-drained. The rainfall of the tract is about 27 inches, confined to monsoon months. The predominating cropping is cereal farming with an admixture of pulses. Cold weather and hot weather crops are taken where well irrigation facilities exist. The main money crop of this tract is tobacco. In the hot weather, *bajri* and fodder *jowar* crops are grown under irrigation. There are, however, a few farmers along the railway

Mr. Patel ploughing his fields



line, who grow vegetables. Mathurbhai is one among them.

Mathurbhai started farming while quite young. His farm was then measuring 5½ acres with facilities of well irrigation. At first the farm was devoted to sugarcane cultivation but Mathurbhai saw in vegetables a better money crop than cane and soon switched on to it. A frugal living helped him to save his profits from the farm and invest this money on a pair of bullocks, two buffaloes and a *rhat* (bucket wheel) which substituted the *kos* (leather bag for raising water). In 1927 the farm had enlarged to 12 acres. In course of time he was able to extend his farm which today has an area of 40 acres.

It was then that he installed a small oil engine of 8 H. P. capacity which he replaced again with a 24 H.P. one and a 5″—4″ pump. Water being the mainstay in vegetable cultivation he wanted to increase the quantity of water and for this purpose took out two bores of 52 ft. and 82 ft. depth in his well so that he could work his engine almost 10 hours a day for about nine months in the year. At times when there is a dry spell his engine works round the clock to keep the crops fed adequately with water. After meeting his own requirements he helps his neighbours by supplying them with water charging Rs. 5 per hour of the run of the engine. The working costs according to Mathurbhai comes to about Rs. 2 per hour.

CROPPING SCHEME

The general cropping scheme he follows for his 40 acre farm is as under :

- 6 acres ginger
- 6 acres *suran* (*Amorphophallus Campanulatus*)
- 8 acres tobacco
- 1 acre *alu* (*Colocasia*) leaves
- ½ acre *pudina* (mint)
- 2 acres sown rice mixed with pulse
- 5 acres *bajri* mixture
- 6 acres millets
- 5½ acres *jowar* fodder (*sudhia* variety)

The general plan of rotation followed by him is as follows :

(*a*) Ginger—*suran*—two or three dry crops to be followed again by ginger. Ginger usually follows a millet crop (*kodra*).

(*b*) *Suran* is harvested from September onwards to be followed by potatoes, irrigated tobacco and cabbage-mixture on the early-harvested area and hot weather crops like *bajri*, fodder, *jowar* and vegetables like *guvar*, *bhindi*, etc.—on the late-harvested area. This will be followed by two or three dry crops.

(*c*) Bajri crop is followed by potatoes and irrigated tobacco.

(*d*) Pudina (mint) is a perennial crop on the farm.

(*e*) No second crop is taken after the other crops.

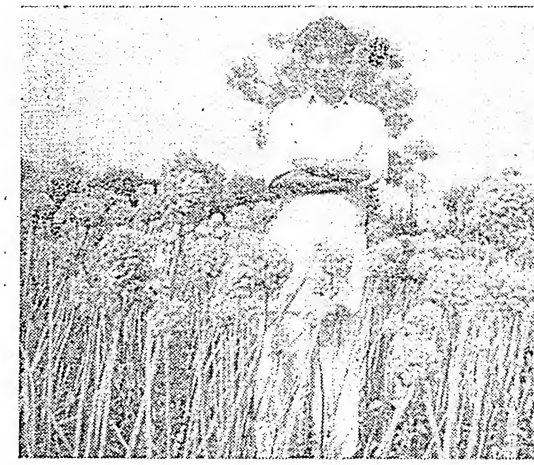
CROP MANAGEMENT

For crops like ginger and *suran*, land is cultivated by a country plough by repeated ploughings, followed by a planking. Land is prepared to about 5 —6 ins. depth. For other crops, the intensity of cultivation is less, but the land is well prepared. For ginger, land is manured at the rate of 50 to 60 cartloads of farmyard manure per acre and for *suran* a little less.

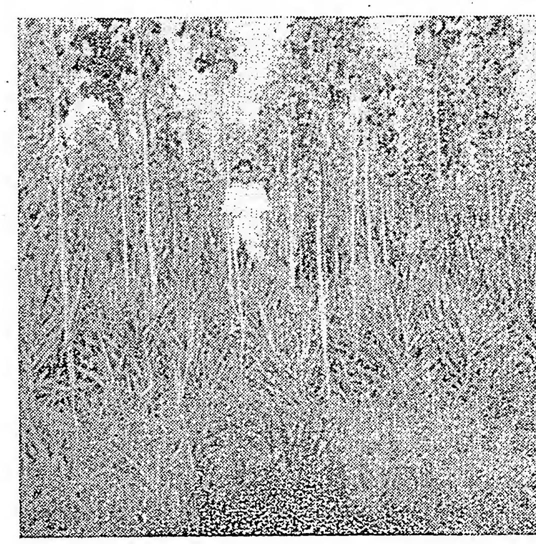
For dry crops, the land gets 5 to 10 cartloads of farmyard manure.

All vegetable crops receive a dressing of oilcake manure at varying rates and according to the requirement of each. Suran is topdressed at the rate of 3,000 lb. of cake, ginger at 1,200 lb. of cake, potato 2,400 lb., *alu* (*Colocasia*) leaves 3,000 lb. in about four dressings, mint 1,200 lb. in about eight dressings and other vegetable crops from 800 to 1,200 lb. of cake per acre. Dry crops are not topdressed. The second crop, however, usually receives a topdressing.

Except *suran* and potatoes, all other crops are raised from home-



Onion crop for seeds



A ginger crop

Alu (Colocasia) crop

grown seeds. The *suran* seed is purchased as home-grown seeds are costlier.

Potato seeds are obtained from Simla. Mr. Patel takes great care in selecting and preserving his own seeds for further use. There is also a good demand for his seeds. The planting of his vegetable crops is spread out in time, to regularize harvest over as wide a period as possible.

He raises his crops in well-laid-out beds and his irrigation management is very satisfactory. Irrigation is given as and when required at an interval of 15 days in the cold weather, and of eight days in the hot weather.

The after-care consists of weeding of irrigated crops and hoeing of dry crops as and when needed. His cultivation is very clean and irrigation beds and channels are always kept in order.

HARVESTING AND MARKETING

The harvest of *suran* starts from September and continues for about three or four months. Before the crop fully matures, most of his produce is harvested. The ginger crop is also harvested at intervals according to the market demand.

Vegetables are usually harvested daily to ensure freshness.

He sends his produce to nearabout market places. He has now built up his market. On his own farm vegetable vendors come daily to purchase their requirements on a cash basis. This is very remunerative to him. He has built up this practice after years of honest and patient work.

When there is a surplus, he sends his produce to nearby towns and cities like Nadiad, Baroda, Ahmedabad and others.

YIELDS PER ACRE

(*a*) Each seed set of *suran* weighs about 4 lb. and the yield at harvest is about 15 to 20 lb. of corm.

(*b*) Ginger seed rate is about 1,600 to 1,800 lb. per acre and yield obtained is about eight times. Along with ginger, turmeric is planted on the bunds yields of which amount to 2,000—3,000 lb.

(*c*) The seed rate for potato is 1,200 lb. per acre and the crop yields 10 to 12 times this quantity at harvest.

(*d*) Of the dry crops he raises, rice gives him 3,000 lb. per acre with 1,000 to 1,200 lb. of pulses; *bajri* 1,200 to 1,600 lb. per acre with 600 to 800 lb. of pulses and millets 2,000 lb. per acre.

As soil fertility of the farm is being maintained at a very high level the yields are usually higher than what others obtain in the area.

FARM MANAGEMENT

Of the 40 acres of the farm, Mathurbhai cultivates about seven acres himself and the rest is cultivated on a labour share system.

He has six bullocks, four buffalo-calves, and four farm hands for his personal cultivation.

The milk from the buffaloes he utilises for use by members of his family. From the cattle he gets about 60 to 70 cartloads of farmyard manure. From each buffalo he gets about 12 cartloads of farmyard manure.

Labour share system, a very novel method he has adopted, is now spreading in the area. By this system he bears all the charges of raising the crops except labour, both men and animals, which the cooperating farmers have to provide. Crops are cultivated under his strict supervision.

As a labour partner every cooperative farmer receives a share in the crop produce as under:

For ginger and *suran* 1/5 labour share

For tobacco 1/4 labour share

For seasonal vegetables 1/4 labour share

For dry crops 1/3 labour share

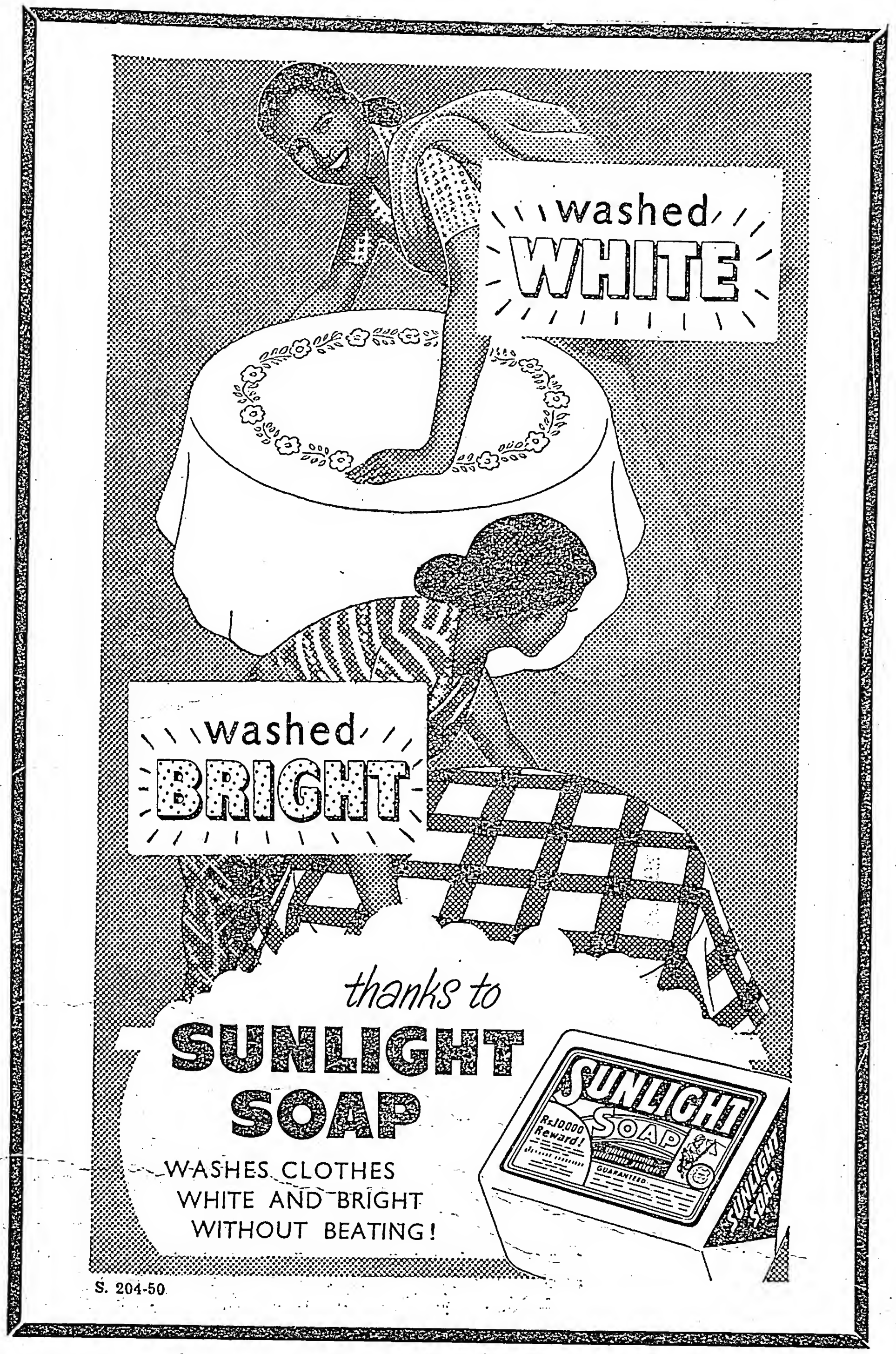
Nearabout ten families are co-operating in this endeavour, and they are satisfied with the arrangements. They have not only not to worry about finding funds but also get all the advantages of expert guidance from such an experienced man as Mathurbhai is.

The approximate cash expenditure on the farm according to Mathurbhai is as under:

	Rs.
Oilcake	10,000
Seeds	15,000
Farmyard manure	1,800
Engine expenses	6,500
Labour, etc.	2,700
Total	36,000

Mathurbhai says he gets roughly Rs. 25,000 net as profit from his farm every year. Mr. Mathurbhai is fully satisfied with his achievements. He says he started with a small field which he has developed into a farm with residential arrangements. He now stays with his family on the farm, though he has got a good house in the village.

Mathurbhai is a master of crop and farm management and knows the technique of cultivation very well. If pests infest or diseases attack his crops he seeks aid from quarters qualified to help him.


washed
WHITE
washed
BRIGHT
thanks to
SUNLIGHT SOAP
WASHES CLOTHES
WHITE AND BRIGHT
WITHOUT BEATING!
SUNLIGHT SOAP
Rs.10,000 Reward!
S. 204-50

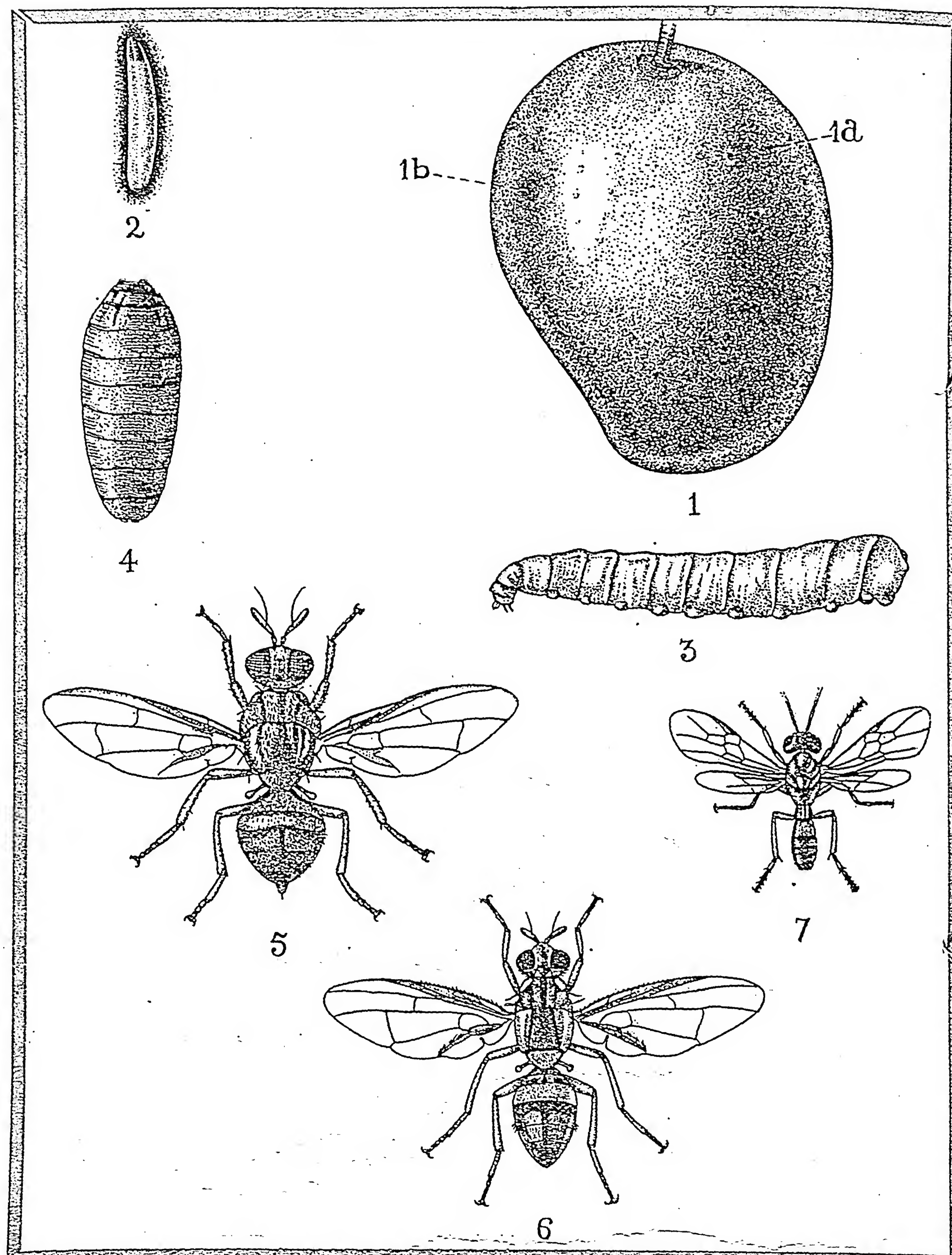
SEASONAL PESTS OF CROPS:

FRUIT FLY PESTS OF OR

By
E. S. NARAYANAN
Head of the Divn. of Entomology,
Indian Agrl. Research Institute,
New Delhi

IT has been said that it is the inalienable right of man to enjoy the fruits of his labour. The verity of this statement has, however, been challenged by insects from the very dawn of agriculture, when man abandoning the nomadic way of life settled down in small communities to cultivate the soil to raise the crops he desired. In their successful invasion and colonisation of the earth the insects have adapted themselves to such diverse habits even in the matter of food, that some attack the plant in the nursery, others in the later stages of the plant growth and still quite a large number attack the fruits as well. To the latter category belong the fruit flies, menace of orchards and kitchen gardens. They cause not only a decrease in the yield and consequent loss to the owners of these orchards and kitchen gardens, but even where the damage caused is negligible the excellence of the fruits and vegetables is destroyed and the commercial value of the crop reduced to such an extent as to make the fruit or vegetable growing industry an uneconomic proposition. The species that cause this damage are mainly the Ethiopian fruit fly, *Dacus ciliatus ciliatus* (Loew), the melon fly, *D. cucurbitæ* Coquillett, the mango fruit fly, *D. Ferrugineus* Fabricius, the peach fruit fly, *D. zonatus* Saunders, and the *ber* fruit fly, *Carpomyia vesuviana* Costa.

Let us now discuss briefly the life history of each one of these species.



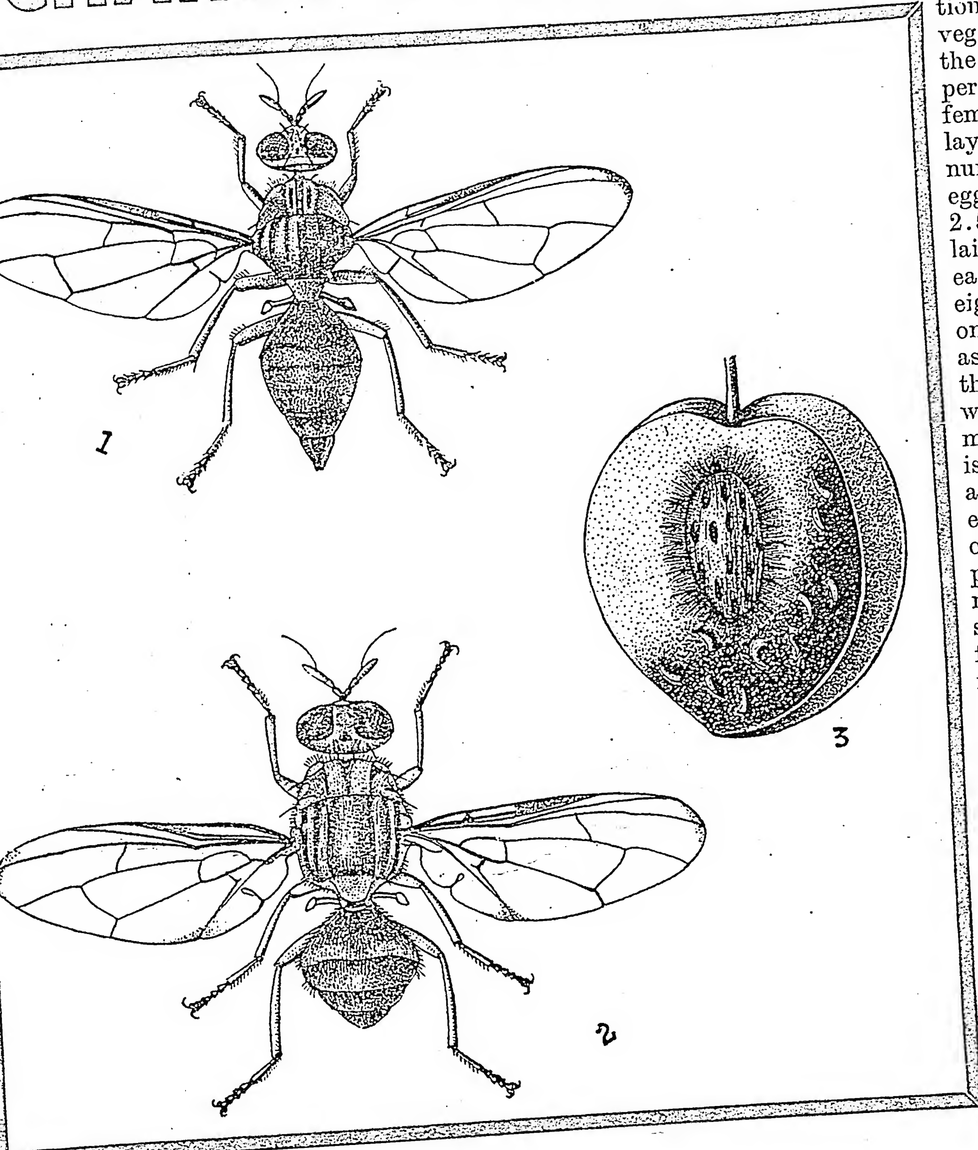
DACUS FERRUGINEUS FABRICIUS

1. Mango showing puncture caused at the time of the oviposition (1a) and the rotten patch developed afterwards (1b) 2. Egg 3. Full fed maggot 4. Pupa 5. Female fly 6. Male fly 7. Braconid parasite

DACUS CILIATUS CILIATUS

This fly commonly known as the Ethiopian melon fly is of African origin. The fly has been recorded from Delhi, Uttar Pradesh, Madhya Pradesh, Madras, Bombay and the Punjab. Outside India it has been recorded from Pakistan, Europe, Transvaal, Sudan, S. W. Africa and Rhodesia. The fly has been observed to cause serious damage to cucurbit vegetables and the various melons. The nature of damage is not very different from that caused by the melon fly, *Dacus cucurbitæ* whose life-history is also described in this paper.

The fly is active throughout the year and six generations have been recorded in areas where there is an equable and subtropical climate.



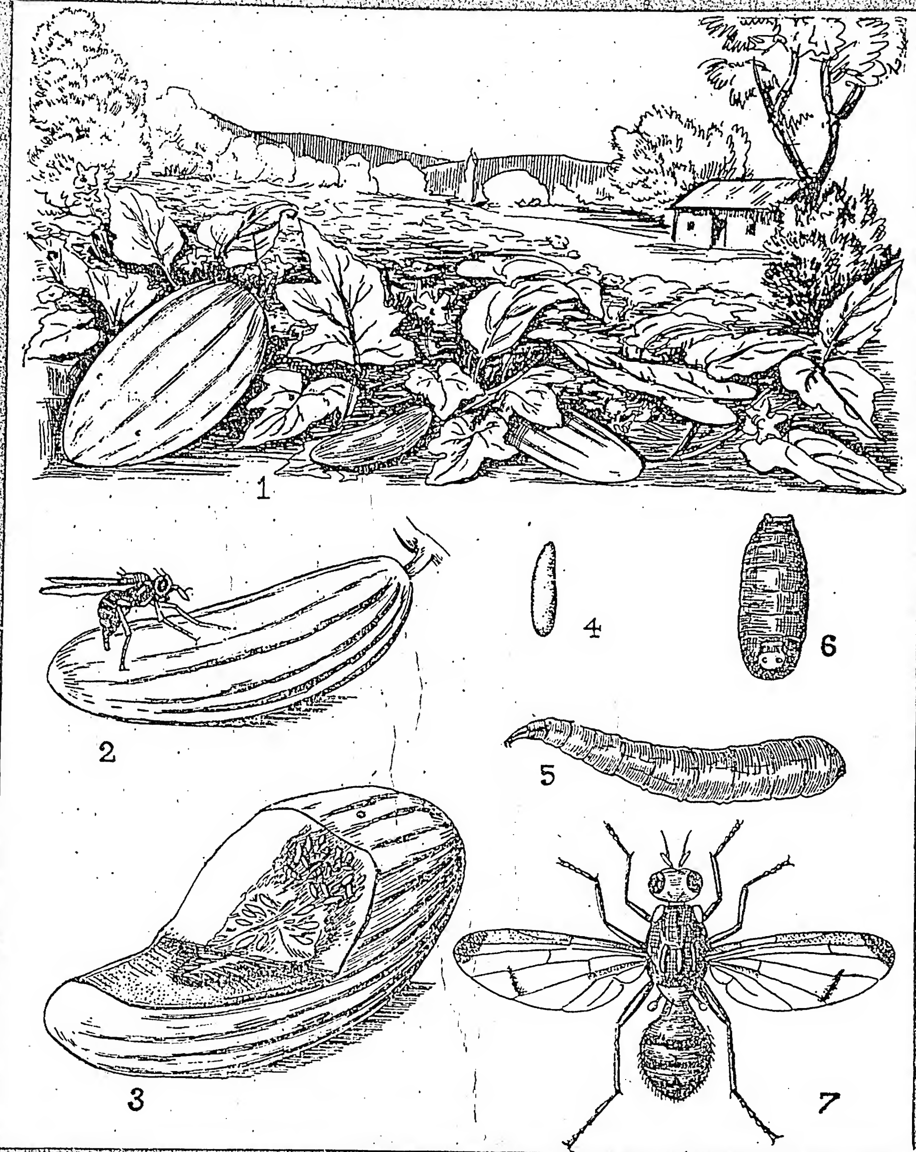
DACUS ZONATUS SAUNDERS

1. Female fly
2. Male fly
3. Damaged peach with maggots in situ

The number of generations is less in the north where there is a clear-cut winter season accompanied by a fall in temperature. In these areas the flies are active upto the end of December and overwinter as pupæ or adults. The adult flies emerge from the pupæ in April and are found flying about in the kitchen gardens in search of cucurbit fruits. The tender fruits that are formed in May are damaged. In Delhi the author has observed that it is the only species that attacks cucurbit vegetables like *kundru*, bitter gourd, water melon, squash melon, musk melon, cucumber and long melon in May and June, when the weather is hot and dry. After the first shower in July both *D. ciliatus ciliatus* and *D. cucurbitæ* are bred from one and the same fruit but gradually the larval population of the latter increases and that of the former decreases. During the heavy rains this species stops breeding and it is again in autumn when the temperature rises and humidity falls that the flies are again found breeding in association with *D. cucurbitæ* in cucurbit vegetables. The adults emerge in the morning and the preoviposition period observed is four days. The female is very active prior to egg laying and goes over the fruit a number of times to select a spot for egg laying. The eggs are embedded 2.5 mm. deep. The number of eggs laid varies between three to eight for each puncture made. As many as eight punctures have been counted on the fruit of *kundru* and as many as 22 eggs have been observed in three punctures. The egg is shiny white, cylindrical, curved and 2.5 mm. in length. The incubation period is two to four days in September and October and very much less in early summer. The egg hatches out into larva which feeds on the pulp of the fruit. As many as 45 maggots have been bred from a single melon fruit. The maggot is full grown within four to six days in October and is 8 mm. long and 1.4 mm. broad. It is cream coloured and has jumping habit like that of *D. cucurbitæ*. The full grown larva enters into the soil ½ to 2 ins. deep for pupation. The pupa is cylindrical, brownish to ochraceous in colour and is 5.5 mm. long and 2.5 mm. broad. The pupal period lasts six to eight days in summer and is longer in winter. Pupation, however, also takes place within the fruit even as the juice begins to dry up. In this character it markedly differs from *D. cucurbitæ* that pupates invariably outside the fruit. The complete life cycle takes about 15-17 days. The fly has six generations under Coimbatore conditions. The adult flies are smaller than *D. cucurbitæ* and are bright brown or ferruginous brown in colour.

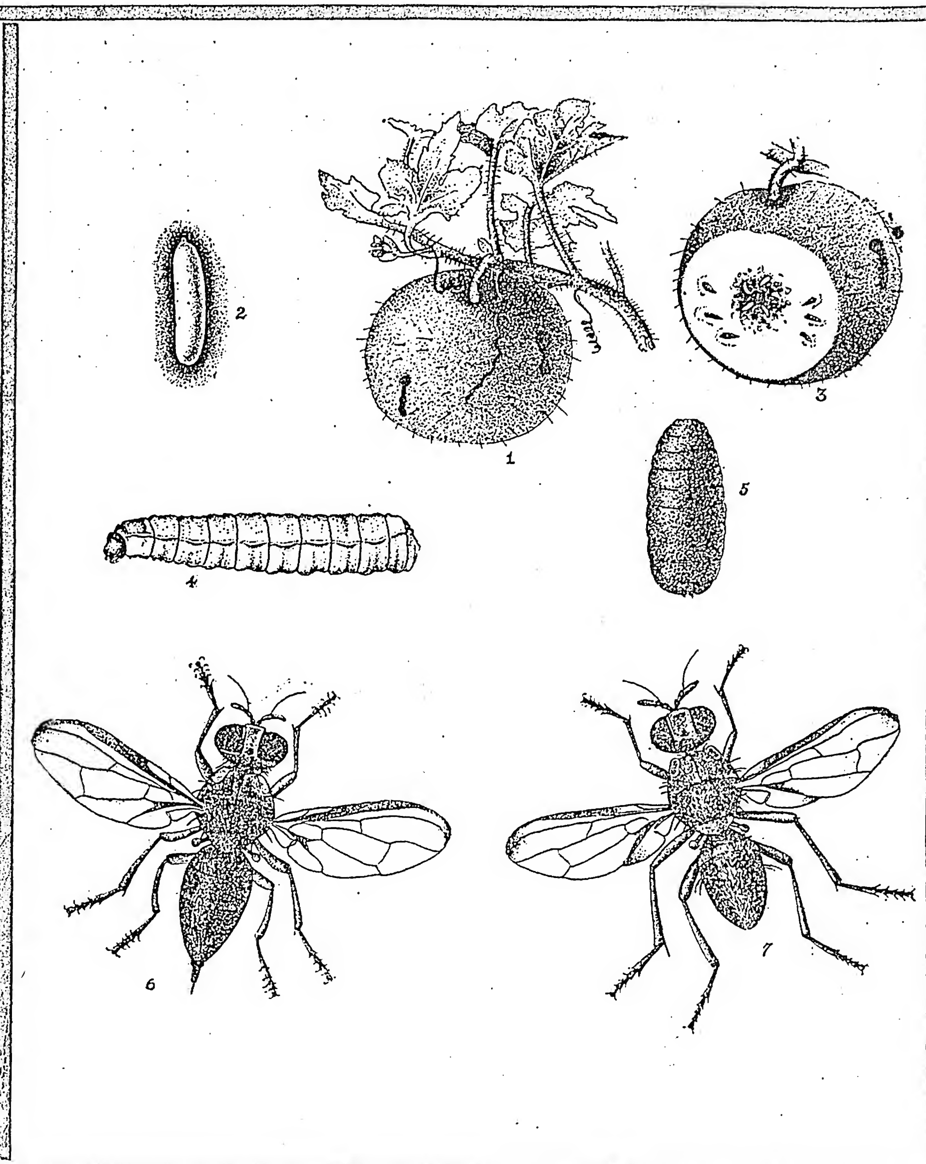
DACUS CUCURBITÆ.

This is commonly known as the melon fly but it attacks a large variety of cucurbits, other vegetables and fruits also. The fly has been recorded from Bihar, Delhi, Uttar Pradesh, West Bengal, Madras, Bombay and the Punjab. Outside India it has been recorded from Nepal, Pakistan, Ceylon, Burma, Siam, Malaya States, Java, China, Formosa, Philippines, Hawaiian Islands and Australia. In In-



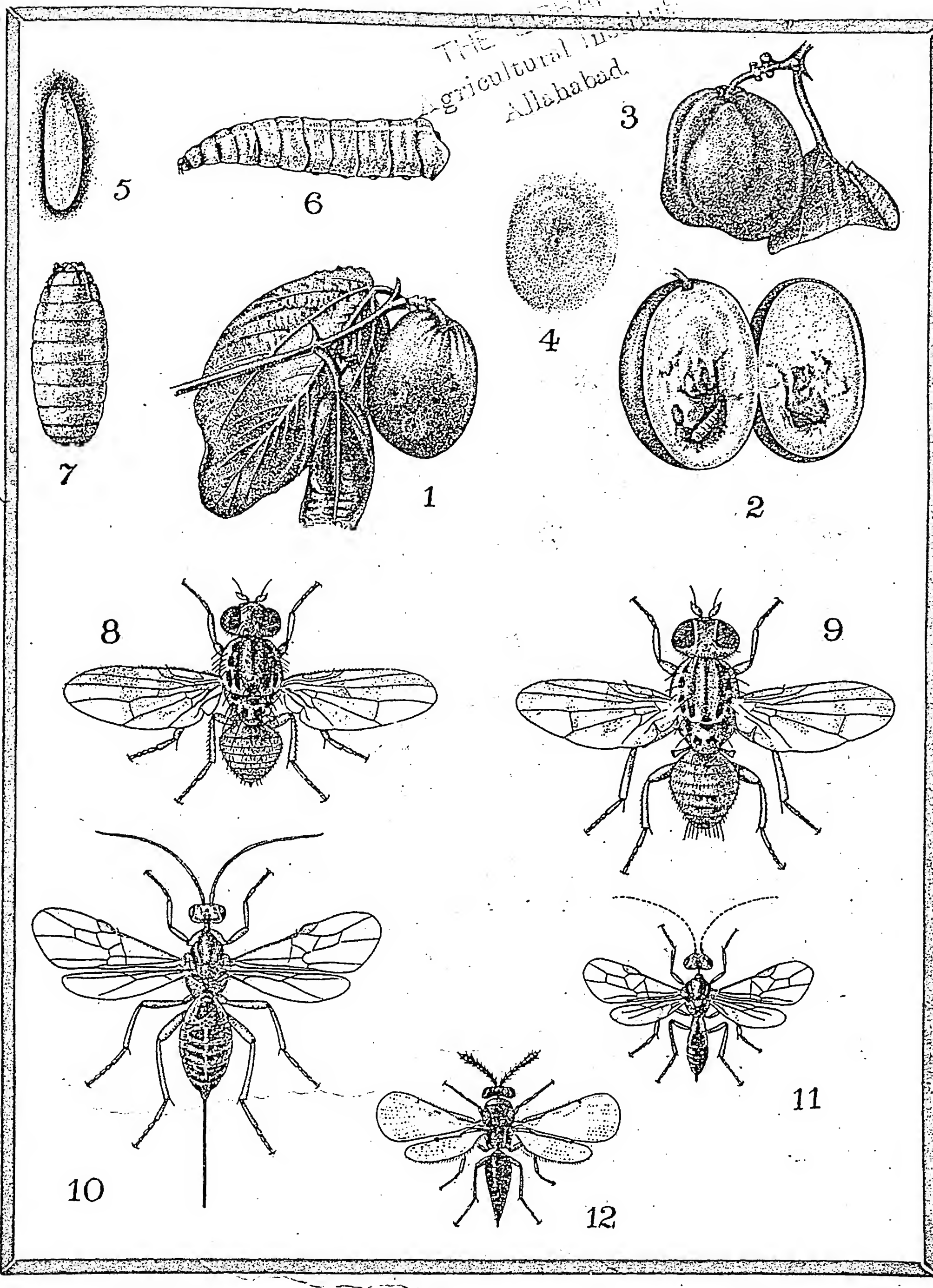
DACUS CUCURBITÆ COQUILLETT

1. A kitchen garden showing the infestation in fruits and vegetables
2. A female laying eggs inside the fruit
3. An infested fruit showing the damage and maggots inside
4. Egg
5. Maggot
6. Pupa
7. An adult fly (male)



DACUS CILIATUS CILIATUS (Loew)

1. Squash melon showing the puncture caused by the oviposition and the resinous deposit at the site of the puncture
2. Egg
3. Damaged fruit with maggots
4. Full fed maggot
5. Pupa
6. Female fly
7. Male fly



CARPOMYIA VESUVIANA COSTA

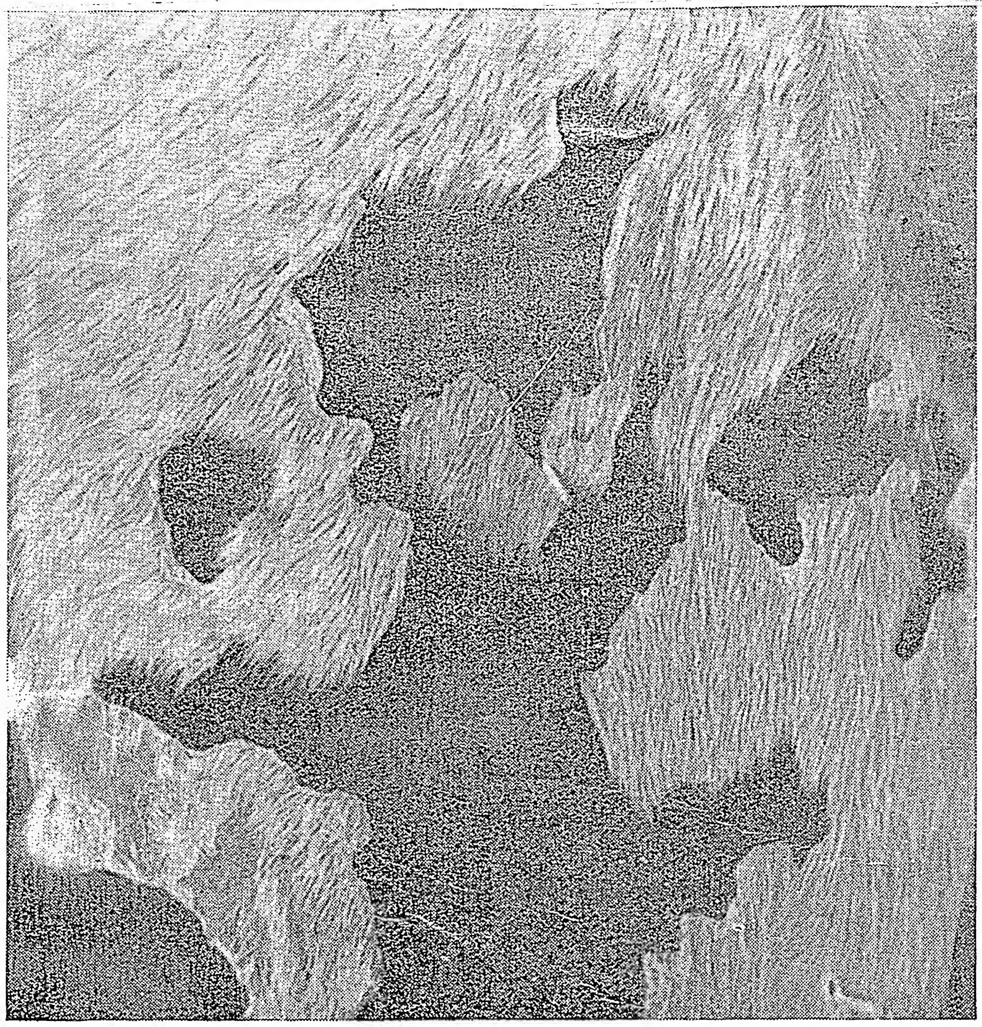
1. **Ber fruit showing oviposition punctures**
2. **Damaged fruit with maggots**
3. **Rugged fruit showing the exit hole of the maggot**
4. **Exit hole of the parasite**
5. **Egg**
6. **Full fed maggot**
7. **Pupa**
8. **Female fly**
9. **Male fly**
10. **& 11. Braconid parasites**
12. **Chalcid parasite**

dia the fly has been recorded from pumpkin, cucumber, musk melon, snap melon, long melon, wild cucurbit, water melon, colocynth, squash melon, bottle gourd, bitter gourd, ribbed gourd, sponge gourd, snake gourd, wild snake gourd, *parval*, *kundru*, galls of *Vitis trifolia*, tomato, brinjal, chilli, papaya, guava, peach, date and citrus.

It is difficult to identify this species from *Dacus ferrugineus* from the nature of attack it inflicts on fruits and vegetables as the external characters of damage are almost the same. The fly prefers young green and tender fruits to bigger fruits with hard rind for the purpose of egg laying. The fly sometimes lays eggs in the corolla and other essential organs of the flower and the maggots that hatch out of these feed on the flowers and a few have been observed to feed even on the stem of the cucurbit vines. When the maggots feed in the stem characteristic galls are formed. The damage that this fly can cause and is causing to vegetable production in our country is insufficiently realised. Oftentimes more than fifty per cent of the vegetables are either partially or totally damaged rendering them in either case unsuitable for human consumption. This species is active and continues to breed throughout the year except for a short period during the winter months like January and February when there is extreme cold. Sometimes egg laying has been observed even during the end of December. There is no doubt that the flies breed throughout the year where the climate is a little equable. In winter this species also has the habit of congregating under the leaves like *D. ferrugineus* but generally the intensity of population of this species is more than *D. ferrugineus*. In severe cold they hide and huddle together under dried leaves of bushes and trees to of conserve the warmth. In March when the weather warms up these flies are the first amongst the *Dacus* species to be on the wing. In places where the premonsoon period is hot and dry the fly takes shelter under humid and shady places and lives on honey dew of aphids infesting brinjal or fruit trees. If under such situations it finds optimum conditions for its breeding it may then oviposit in guava, peach or cucurbit fruits grown as creepers under the shade of trees. Cucurbits are preferred but it is under such exceptional circumstances explained above that the fly is forced to breed on other fruits. During the hot and dry months it is *Dacus ciliatus ciliatus* that actively breeds on all forms of *Cucurbitaceæ* and the population of *Dacus cucurbitæ* in the fields is, therefore, low.

It is in the rainy months of July and August that the activity of the fly is at its peak and causes heavy damage to squash melon, bitter gourd, ribbed gourd and long melon.

(*Continued on page 29*)



Goat-skin damaged by the leather beetle

LEATHER BEETLE (*Dermestes vulpinus*) IN INDIA

By B. N. SONI
Research Officer (Hides & Skins), Indian Veterinary Research Institute, Mukteswar-Kumaun

NEXT to warble-flies and ticks, the most important biological factor causing an enormous financial loss to the hides and skins industry in India, is the leather beetle (*Dermestes vulpinus*) also known as "hide beetle". Unlike warble-flies and ticks, which affect the hide or the skin during the life time of the animal, the leather beetle causes damage during storage of the raw stock. As a result of the inadequacy of transport facilities, a large proportion of the Indian hides and skins are stored in dark and damp godowns, before arrangements could be made for transporting them to the nearest tannery or to a sea port for foreign export. The leather beetle which breeds profusely under warm and moist conditions, has been observed to have damaged 25 to 30 per cent of a consignment of hides and skins placed in storage. The incidence and intensity of damage is higher in "dry cured" hides and skins than in those which have been preserved under "wet-salted" condition. Presumably the salt plays the role of an insecticide and the salted hide substance is perhaps unpalatable to the insect which, as a rule, eats into the "flesh-side" of the hide or skin.

DAMAGE

The nature and the extent of damage caused by the leather beetle to hides and skins in India has been the subject of a short study at the Indian Veterinary Research Institute, under a scheme of research financed by the Indian Council of Agricultural Research. During the course of this study experiments were conducted by bringing into direct contact batches of the insect and "dry cured" pieces of hides and skins. Observations recorded have shown that (*i*) pieces of hides and skins placed in dark and damp corners of a room showed a considerably heavier infestation and more damage than those placed in the area of the room where it was comparatively dry and admitted more of daylight; (*ii*) the larval stage of the bettle causes more damage than the adult stage; (*iii*) the damage done by the insect was more on the "flesh-side" than on the

"grain-side" of the hide or skin; (*iv*) the insect prefers to feed in the folded hides and skins compared to the unfolded ones; (*v*) the damage was more on the edges of the hide pieces than in the centre, while in the case of the skins there was no such demarcation. The insect devours the whole fibre tissue of the hide or skin leaving only the epidermis or the thin outer layer.

CONTROL MEASURES

"Prevention is better than cure" is the maxim which applies most appropriately in checking the enormous financial losses caused by the leather beetle to the industry of hides and skins in India. It is not only the pre-application of certain chemical drugs such as Gammexane and DDT which would act as insecticidal and repellent agents, but measures such as the "wet curing" of raw stock with adequate quantity of common salt, proper æration and periodic exposure to daylight of the hides and skins stored in godowns with cemented floors, would go a long way in avoiding a large proportion of the financial drain suffered by the industry as a result of the leather beetle attack.

The chemical method of prevention against leather beetle, employed generally at present, is known as arsenication or "poisoning" of the hides and skins in storage. A stock solution is prepared by dissolving 10 lb. of caustic soda in a small quantity of water. This causes the water to become hot. While it is still hot 35 lb. of white arsenic (sodium arsenite) is stirred into the solution. The quantity is made upto 50 gallons with cold water. This stock solution is diluted 30 times in preparing the immersion bath for the hides. It contains 0.25 to 0.3 per cent of sodium arsenite. The hides or skins to be treated are immersed for one to two minutes in this solution. Although the process is known to yield fairly satisfactory results but a certain amount of technical knowledge involved in the preparation of the solution and its poisonous properties is a considerable drawback for its adoption in this country. It was, therefore, considered essential to acquire first hand knowledge regarding the use of Gammexane and DDT for the control of this parasite.

Comparative tests carried out under laboratory conditions have shown that Gammexane powder at a concentration of 2.5 per cent in talc-powder, when dusted to form a thin film on the "flesh-side" of hides or skins infested with leather beetle, causes a mortality of 85-90 per cent among beetle larvæ and is followed by 10 days as a period of protection from re-infestation by the parasite. A quantity of about 4 oz. of Gammexane powder mixed in talc is considered enough to dust nearly eight cow or ox-hides or about 15 goat or sheep-skins.

COST

Taking into account the cost of labour involved and the price of muslin bags, through which the powder is dusted, the total expenditure for a consignment of 100 hides or double the number of skins, works out to nearly Rs. 3-4 normally.

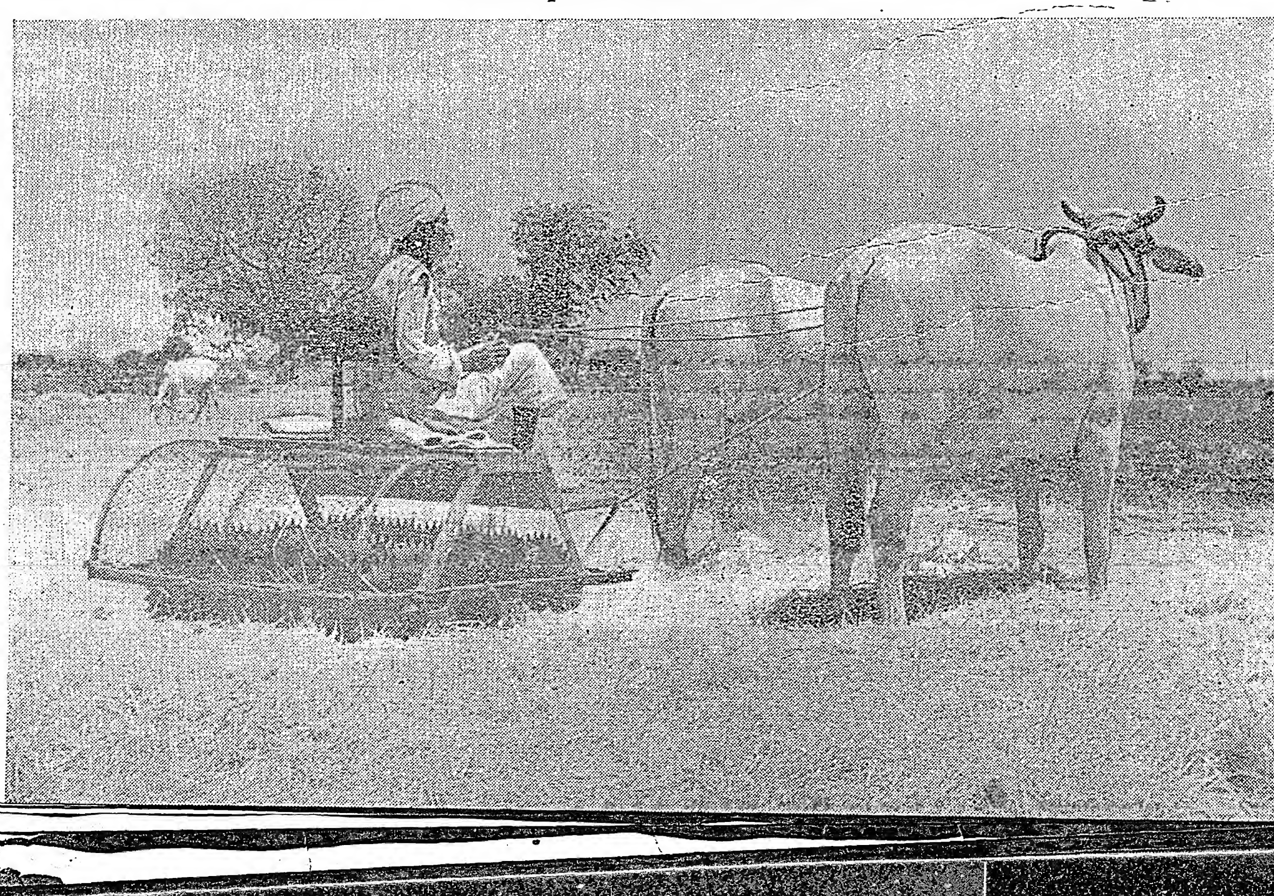
In view of its non-toxic properties to man, and easy availability in the form of ready made powder, Gammexane may, in due course of time, replace the present method of arsenication or "poisoning" of hides and skins for prevention and control of leather beetle in India.

THRESHING WHEAT BY A

A tractor and disc harrow being used for threshing wh eat at Nangloi, a village near Delhi

TRACTOR AND DISC HARROW

An "Olpad" thresher at work



By R. V. RAMIAH

Division of Agricultural Engineering, I.A.R.I., New Delhi

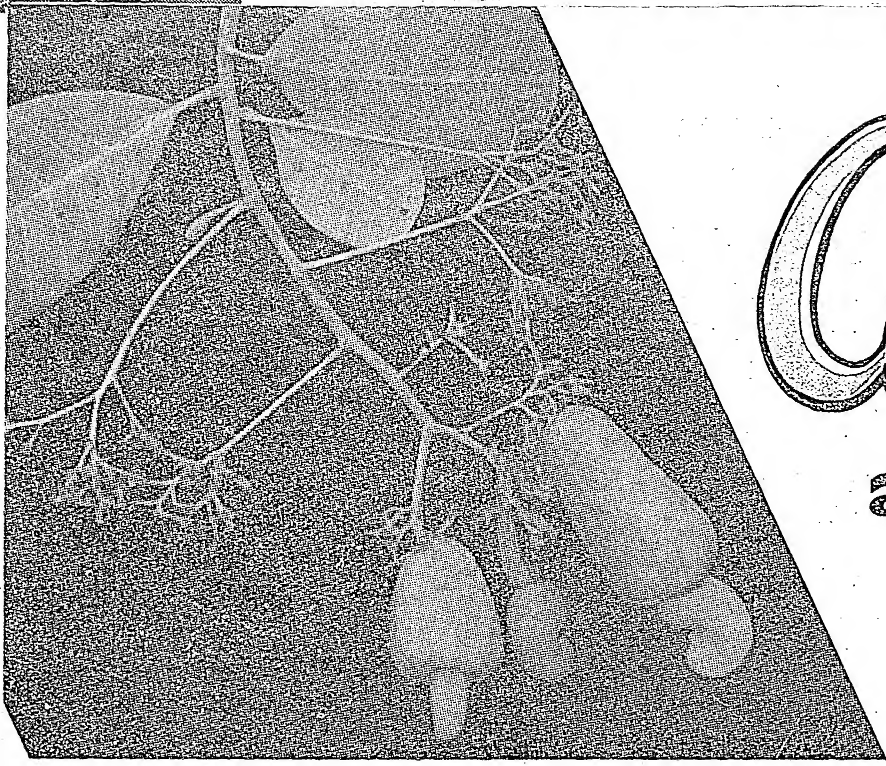
IN the northern wheat regions of India, April, May and June are busy months for the farmers. The wheat crop has to be harvested and threshed and land has to be prepared for the next *kharif* crop. In such busy periods, labour-saving implements and machines are used in the western countries. Some machines used for harvesting and threshing in those countries are being tried in India too. Some of them are even already being used for threshing small grains. However, before any machine designed and used abroad can be successfully used in India, and be economically justifiable, it will have to be adapted to the requirements of agricultural practices prevalent in this country. For instance, in threshing wheat, we have to produce *bhusa* (wheat straw) and separate the grains simultaneously, while in foreign countries, the former is not considered to be of much value. Hence a serious disadvantage has been experienced in using a threshing machine for wheat manufactured abroad. It is this that the imported threshing machines do not produce *bhusa*, which is of importance to the farmer in that it provides him with cattle feed. Threshing machines serving this double purpose were in production in the U.K. some years back, but they are not manufactured now.

With a purpose to evolve a satisfactory implement which could produce *bhusa* as well as separate the grains, experiments were conducted in a group of villages in Delhi with a tractor and a disc harrow which treads on the harvested crop in much the same way as is done by bullocks. This method became extremely popular among the farmers of these villages who were anxious to get their crops threshed in this way even on payment. A tractor with 15 D. B. H. P. and its disc harrow yielded 50-80 md. of wheat grain in a 10-hour operation. A driver and an assistant were, however, necessary for doing the work. The cost including depreciation and other charges worked out at Rs. 35 to 40 per day.

The main advantage of this method as against the indigenous one is that it produces *bhusa* of much finer quality. It can operate on the same kind of threshing floor as is used for threshing by bullocks; moreover, the wheat grains are not damaged in any way.

While a tractor and a disc harrow of this type cost about Rs. 8,000 or over, a bullock-drawn disc-harrow type thresher is comparatively very cheap. The latter is called the 'Olpad' thresher and each implement, suitable for a pair of bullocks costs Rs. 150 together with a wooden frame. The farmers who have used this in the Delhi villages, state that working with this implement takes less than half the time than that required for threshing by bullocks. Four 10-hour days were required for producing 50 md. of wheat grain with 'Olpad' thresher. While many farmers expressed a desire to purchase the 'Olpad' thresher, others were prepared to take them on hire.

This machine is not so fatiguing to work with as the old method. Moreover, additional weight required to produce better quality *bhusa* is ensured by this machine. This also helps to crush the nodes of the straw. Again, the 'Olpad' thresher can be pulled over the threshing floor by a pair of bullocks, while in the old method more than two bullocks are hitched side by side working in a circular path. Besides being inconvenient, injury is sometimes caused to the legs of the bullocks by this inconvenient hitching and circular treading.



Cashewnut-

a dollar earning crop of INDIA

By U. NARASINGA RAO and V. N. MADHAVA RAO
Agricultural Research Institute, Coimbatore

A typical cashew infloresc ense showing the cashew fruit in three stages of development

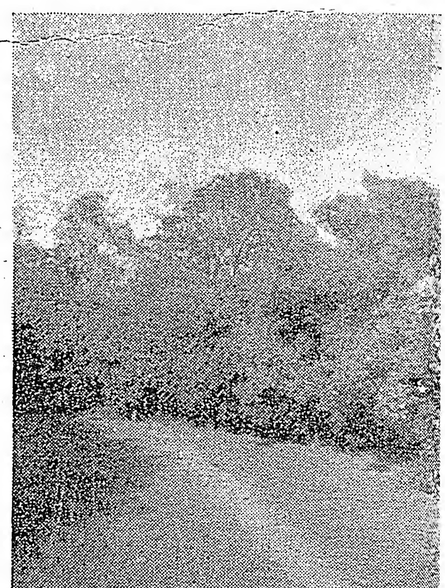
THE cashewnut was introduced into India from Brazil by the Portuguese some 400 years ago primarily to check soil erosion. It has become naturalized on the West Coast with the passage of time and is now a crop which vies with other commercial commodities like pepper in earning dollars for our country. A flourishing export trade has established itself on the southern west coast with scope for further expansion. India is by far the largest producer of the cashewnut in the world with an estimated annual output of 60,000 tons of nuts valued at about seven crores of rupees. She claims more than 95 per cent of the international trade in cashew kernels. The U.S.A. is the principal buyer of not only the kernels but also the cashew shell oil which is a valuable by-product with manifold uses. In 1948, kernels valued at 15 million dollars and shell oil worth half a million dollars were exported from India.

The cashew kernel is a very nutritive food. It contains 21.2 per cent of protein, 46.9 per cent of fats, 0.45 per cent phosphorus, 5.0 per cent of iron and Vitamins A and B. The kernels are used for a variety of purposes. In their roasted form, they are used for flavouring and improving sweet dishes and in the preparation of confectioneries. Salted kernels are popular not only in restaurants and coffee houses but even on the pavements of towns and cities where a busy trade is carried on by the sale of packets of nuts. In Europe and America the kernel is largely used as a dessert and to an extent in the manufacture of nut chocolates and confectionery.

The other products obtained from the cashew tree are the apples, shells of the nuts and the shell oil. These are all rich sources of income to the grower. The cashew apple which is the swollen stalk of the nut is the true fruit and is eaten in its fresh condition. The expressed juice from the apple can be made into an agreeable syrup; it is also taken to arrest vomitting and as a gargle for catarrh. The shells are generally used as fuel by the cashewnut processing factories. The shell oil has

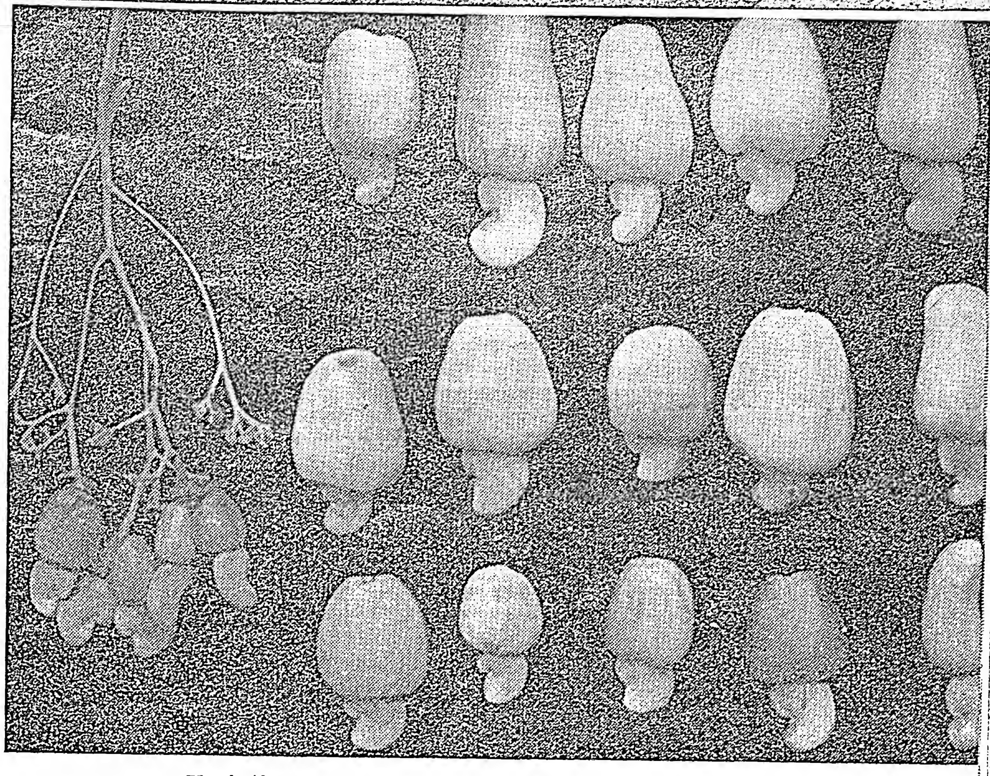
A vigorously growing cashew tree at the Fruit Research Station, Kodur

Cashew employed a



been found to be highly useful as a water proofing agent, as a preservative in painting of boats, fishing nets and light wood work and in the manufacture of varnishes, typewriter rolls, oil and acid proof cold setting cements, industrial flooring tiles, baking enamel, gums, inks, oil cloth, paints, water-proofing paper, etc. It is also said that the oil is used for treatment of cracks on soles of the feet, warts, corns and leprous sores. The sap of the plant has been employed in preparing indelible ink. The gum oozing from the tree has been in use for book binding. The leaves have medicinal uses, especially in skin affections and burns. A decoction of the bark is given for treatment of severe diarrhoea. The peelings (outer skin on the kernel) can be fed to poultry which thrive on them. The wood is used in Ceylon and Burma for packing cases, boat building and charcoal. A closely planted belt of cashew trees has been found at the Fruit Research Station, Kodur to be very effective as wind break for orchards.

In spite of the manifold virtues of this useful tree, it is essentially a wasteland crop in this country, on which little cultural attention is bestowed. The local production of cashewnuts falls short of the export demand and appreciable quantities are imported every year practically all from Portuguese East Africa, to be processed in India and exported to America. It is understood, however, that the African sources for our supplies of the raw nuts may no longer be freely available, as that country is establishing her own processing factories with a view to export her produce directly to the U.S.A. To meet this eventuality, it is highly necessary for India to increase her production of cashewnuts both by extending the area under the crop as well as increasing the output from the existing areas.



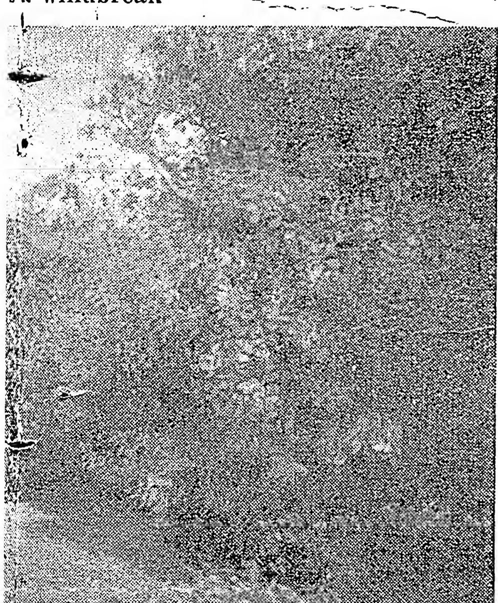
Variations in cashew apple and nut characters

DISTRIBUTION

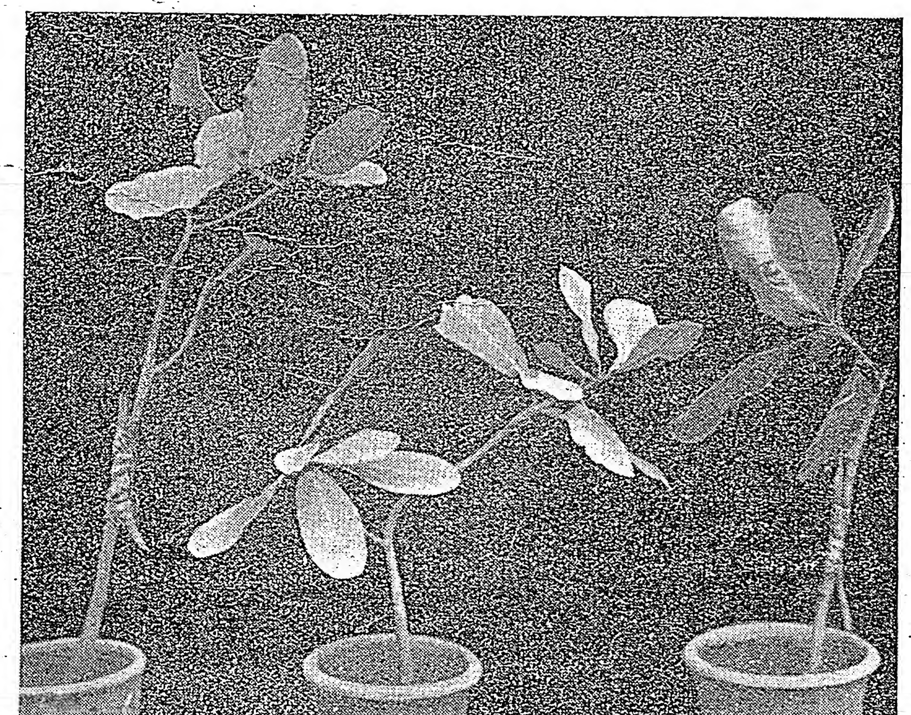
The cashew is chiefly grown in the coastal districts of India, viz., Ratnagiri, and North Kanara of Bombay, South Kanara, Malabar, Tiruchirapalli, Tanjore, Tirunelveli, South Arcot, Godavari and Vishakapatnam districts in Madras and in the United States of Travancore and Cochin. Nearly 50.2 per cent of the total production comes from Madras State as compared to 36.5 per cent from Travancore and Cochin and 9.7 per cent from Bombay. The largest production centre in India is South Kanara in Madras State.

(*Contd. on page 32*)

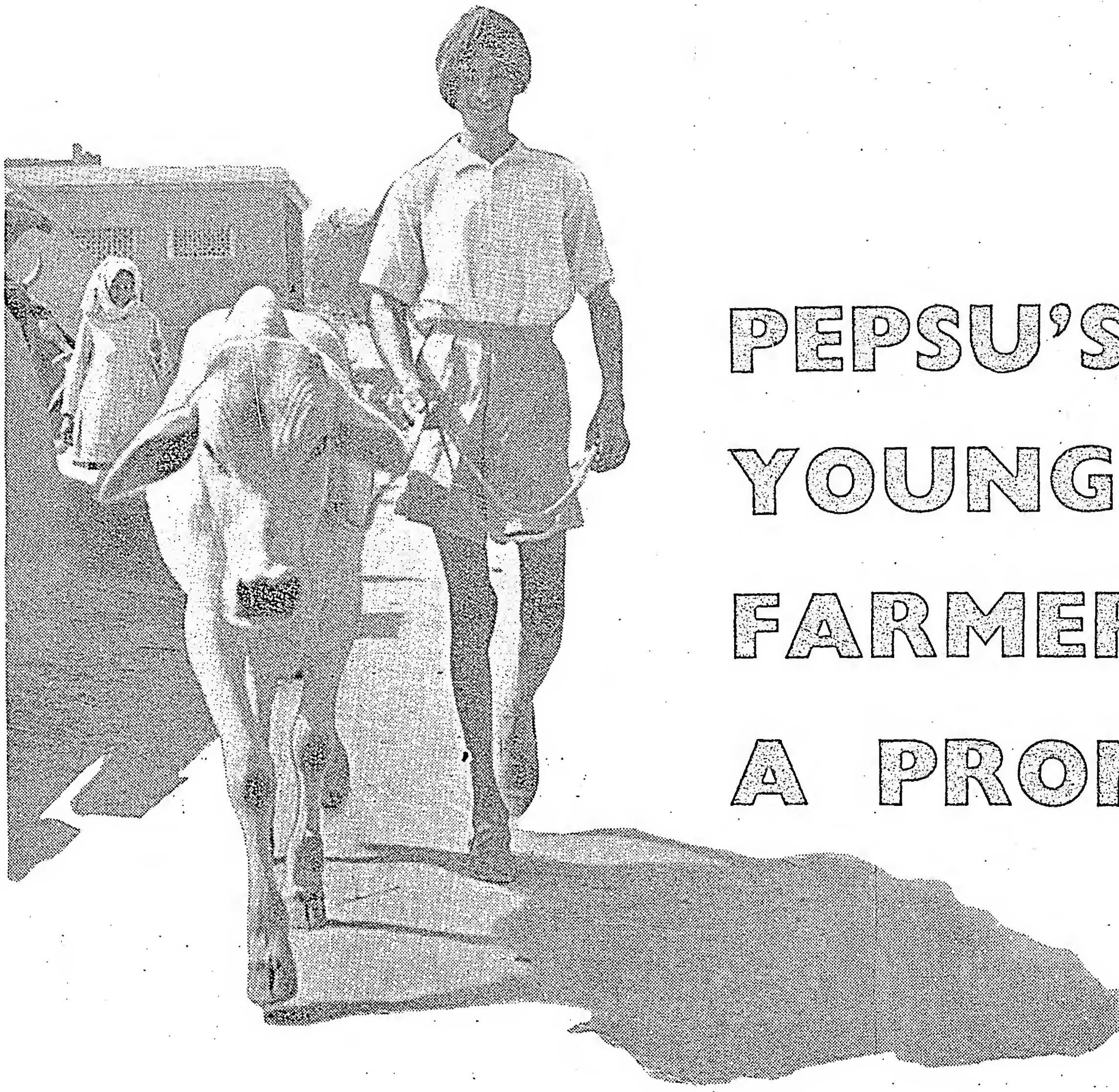
s a windbreak



Cashew clones—the two plants at the extremes are grafts on cashew seedling rootstocks; the midddle one is a rooted layer.



PEPSU'S YOUNG FARMERS— A PROMIS



Labh Singh the first young farmer of Bishanpura

By
AMRIK SINGH CHEEMA

PEPSU'S pioneer move to establish the Young Farmers' Organization places before the country the panacea to many of its rural ills. Specifically stated, the rural problems centre round the improvement of economic and social standards of the village people. This can possibly be attained by adoption of better and more profitable farming practices. A happier social order may be brought about by creative efforts in the fields of education, health, cooperation, etc. The National Five Year Plan seeks to set up a countrywide Rural Extension Service as an agency to work for the ends indicated above. The record of the 4-H clubs and Future Farmers' Organizations in the U.S.A. and Japan, indicates to the tremendous potentialities of such an organization in this country as well.

Manpower is an asset to India but it must be properly used by channelizing the people's energies into productive and creative fields. The past efforts at improving the rural life were individualistic and their scope was limited only to the adult farmers. This had a double disadvantage. The adults were less inclined to be initiated into new creative programmes while at the same time the youngman with impressionable mind remained neglected. As such the extension programme which is our new line of approach to the solution of rural problems must concentrate on the young.

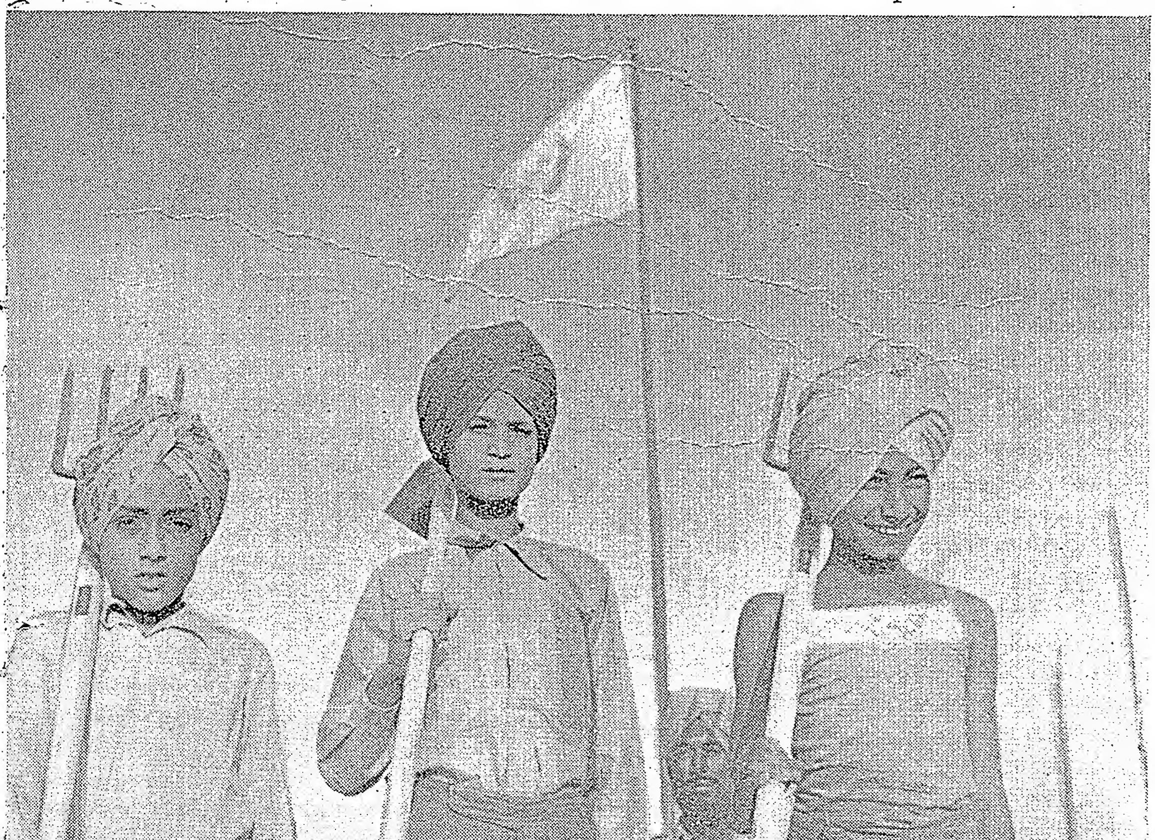
The writer of this article has ventured to start clubs on the lines of the 4-H clubs in the U.S.A. in Pepsu in the Bhadson project area as a preliminary trial. It is worthwhile to study some details of the actual working of these clubs. There are at present 23 clubs with a total membership of 250 farm boys. The first of these clubs was informally founded four months ago in the village Bishenpura, where Labh Singh, a youth of 17, offered to be enlisted as the first Young Farmer and brought his little calf to be reared on proper lines. Thus started, the work gained considerable momentum.

A young farmer hoeing his onions

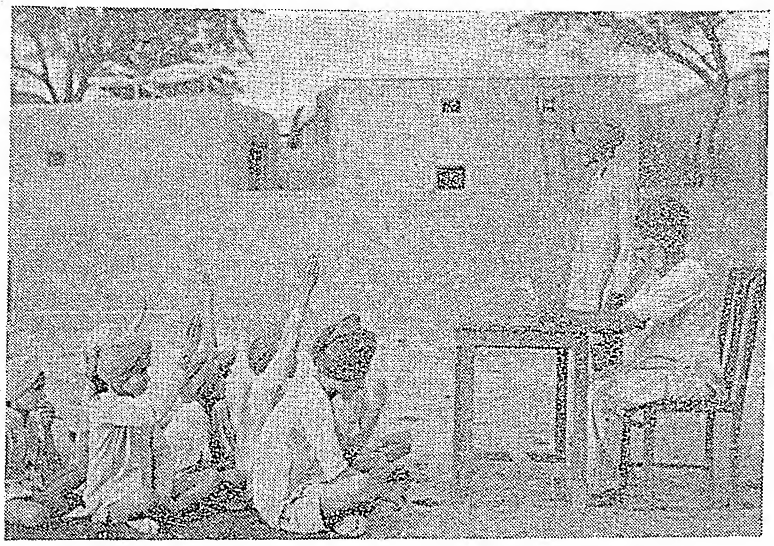
SE FOR THE COUNTRY

ORGANIZATION

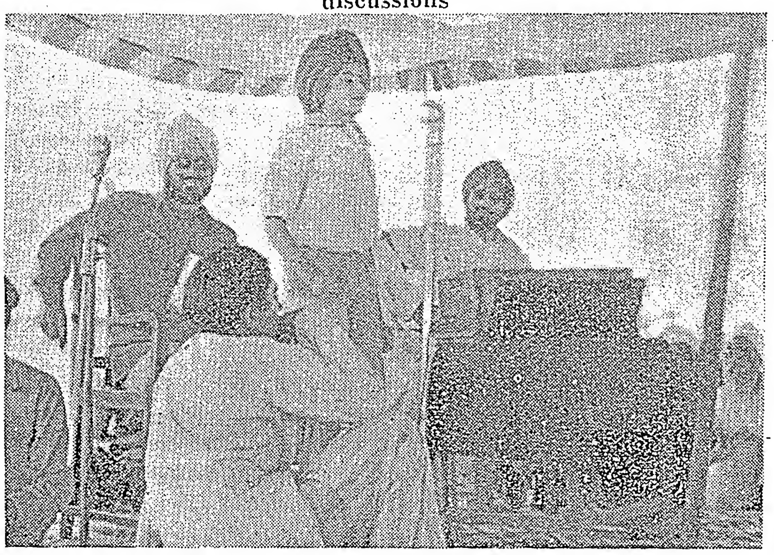
At the very outset, it may be mentioned, that the clubs established are meant for boys only. In the Extension Project Area, we have employed 20 Village Level Workers, each working in five or six villages. Only one club has been organized in a village under a Village Level Worker. The minimum membership of any club is 15 and age limits of the members are 10 to 18 years. The group consists of school going and non-school going boys in the ratio of 40 : 60. Each club has been informally put in charge of a leader, who is an adult village farmer having faith and interest in the scheme. The members have elected their office bearers, President and the Secretary, to conduct their formal meetings which are held at least once a fortnight. This is an attempt to teach them how to sit together, discuss problems and find solutions.



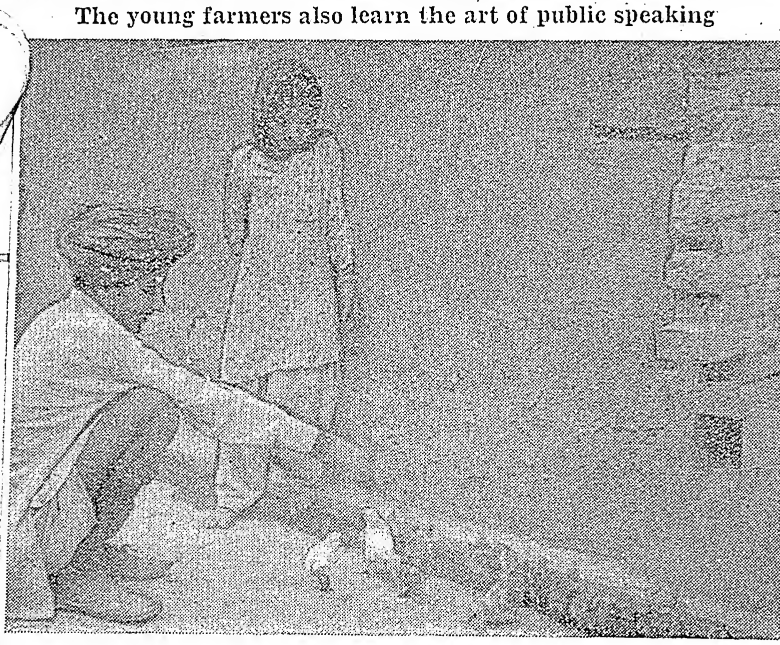
A group of enthusiastic young farmers



Young farmers meet once a fortnight for group discussions



The young farmers also learn the art of public speaking



A good pastime and a means of training as well; a young farmer feeding his chicks while his sister looks on interestedly

The enlistment is made by the Extension Officers after full satisfaction that the boy will take sufficient interest in the activities of the club and his parents are willing to allow him to join and also give him some financial assistance. It may be mentioned here that the response from the villagers has been very encouraging.

WORKING

Each member has been allotted a specific item of activity called "the project" to pursue for the whole year. These projects provide a means of training in the improved practices in the field of agriculture and animal husbandry. Taking into consideration, the local agricultural conditions, the customs of the people, etc. the main projects selected were as follows:

1. *Crop production*: A member is required to raise any crop in 1/5 of an acre in each cropping season. He will look after this piece of land himself right from the sowing upto the harvesting time, following improved practices for all the stages of crop growing. There are 71 such projects, where the parents have set aside the land required for use of their sons.

2. *Vegetable gardening*: In this case, a member has to raise two *marlas* of vegetables by improved methods. The number of these projects is 35.

3. *Fruit gardening*: Those who take interest in plant growing, usually the lower age group, are required to nurse five or seven fruit plants. Forty-nine boys have taken up this work.

4. *Calf rearing and goat keeping*: Some of the members come from families having no holdings or some show a natural aptitude towards animal husbandry. These projects, therefore, require that the members should rear small calves or goats, feed them regularly on suitable rations, look after their health, etc. so that they grow into strong and well-built animals. The number of boys who have taken to this programme is 57.

5. *Poultry raising*: This type of project implies that the members taking it up will hatch chickens from 12 eggs from improved breeds in the beginning, look after them and carry on the work further. The number of members who have accepted this programme is 42.

6. *Other projects*: These include digging new manure pits and minor items of work in carpentry and smithy. The number of projects in the former category is two and under carpentry and smithy, five.

In the matter of selection of projects for adoption by individual members, preference of the boys and their parents, existing facilities, etc. were taken into consideration. Fruit plants, vegetable seeds, ammonium sulphate for manuring, poultry and eggs of improved breeds were supplied by the Extension Service at specially reduced rates in order to obviate financial burden on individual members adopting particular projects.

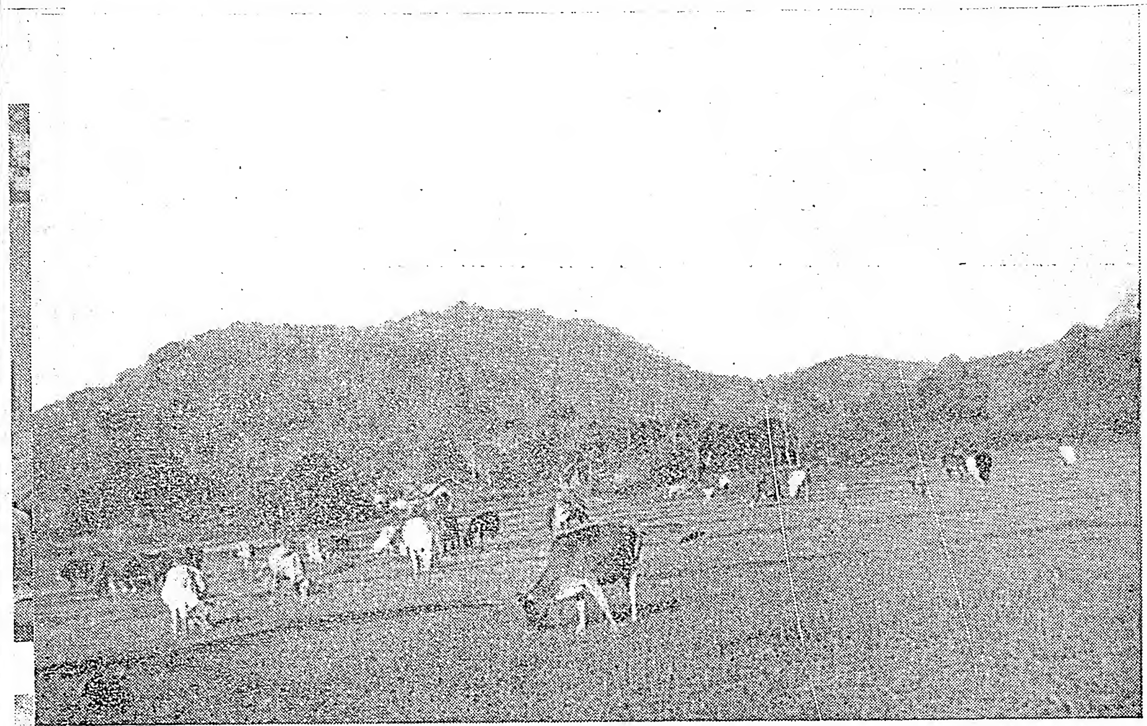
The school going members devote a part of their time to the project work after the school hours.

Record Books have been prepared and prescribed for keeping accounts of the progress of activities of members both as individuals and as groups. The village workers are specially to take care of this record and guide them in every detail. These books carry columns both in English and Punjabi (the local language). It may be pointed out here that emphasis given is more on training rather than monetary gains of individual members.

(*Contd. on page 26*)

FOOD
OF C
IN A

By H. N.
Animal Nutrition Res



Grazing conditions of Assam

ASSAM, the eastern gate of India consists of two main regions—the hills and the plains. The hills are inhabited by numerous wild beasts and birds and have nearly 1.1 millions of human population and 1.38 millions of domestic livestock. The plains bear innumerable wild birds and contain about 7.95 millions of human beings and 12.07 millions of livestock.

The number of cattle per 1,000 of human population in 1941 was about 568 which increased to 581 in 1945. In 1951, this number decreased to 568. Even then, it may be considered a high figure as compared to some other States of India. But this does not mean that Assam is rich in her cattle wealth.

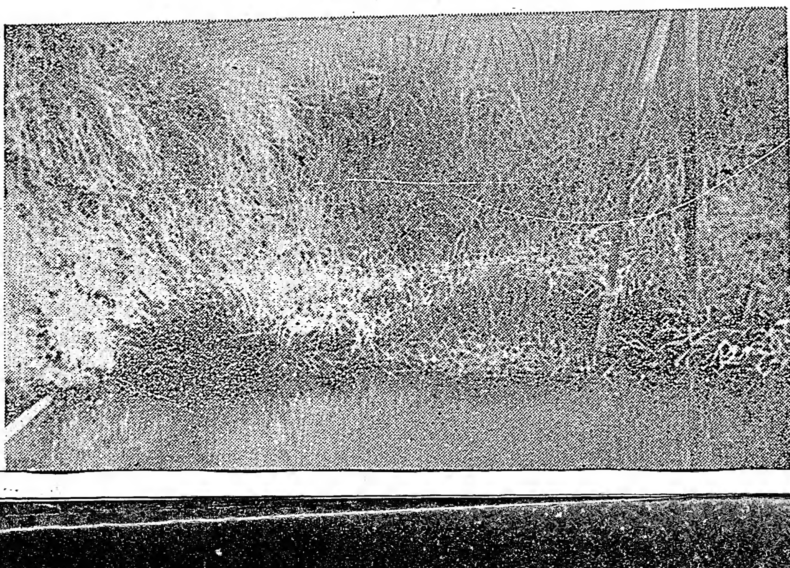
The indigenous cattle of Assam are not heavy yielders but Providence has not neglected to endow these animals with sufficient milk producing capacity of at least half a gallon of milk per day over and above the feeding requirements of their calves. The present poor productiveness may either be due to the food shortage for their adequate nutrition or lack of proper breeding and up-keep. The increase of human population and consequent pressure on land have adversely affected the supply of natural pastures to the animals. This has further been worsened by the rapid increase of cattle population after the second world war. So much so, that even the cattle at rest are unable to maintain their usual health by grazing over the available pastures. Evidently, this has caused gradual deterioration of the indigenous stock both in health and efficiency.

PRESENT POSITION

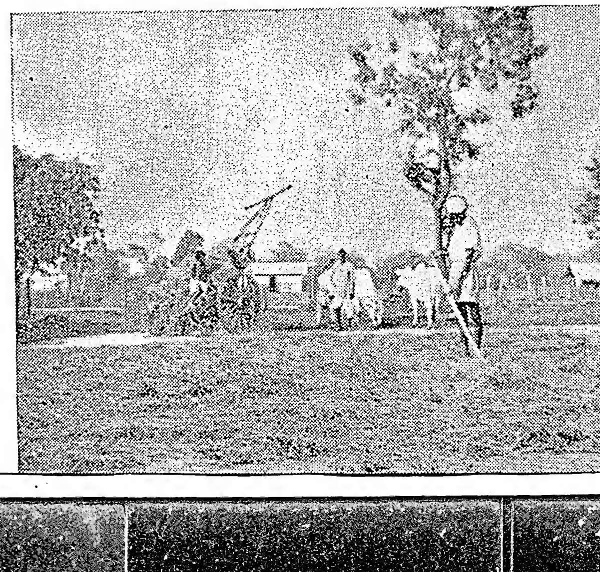
Cattle are seldom stall-fed in Assam and depend mostly on grazing. The present position of grazing areas is not very happy. The major part of the available highland pastures is covered with jungles and fodders of low qualities. The remaining portion is practically barren for the major part of the year. Some portions of the low and the semi-lowland areas (free from water-hyacinth) produce enormous quantities of different grasses. Experiments carried out by Talapatra, *et al* reveal that some of these grasses are superior to many of the cultivated fodder crops of India in so far their organic nutrients are concerned. But unfortunately they are poor in calcium. Even *ad libitum* feeding cannot assure a positive balance in adult animals at rest. Nevertheless, these grasses can constitute the foundation ration.

These grasses grow profusely during the monsoon months but most of them are not accessible to cattle due to environmental conditions and are wasted. It is,

'Uri-dal' (Oryza sativa var fatua) an aquatic grass, best for hay-making

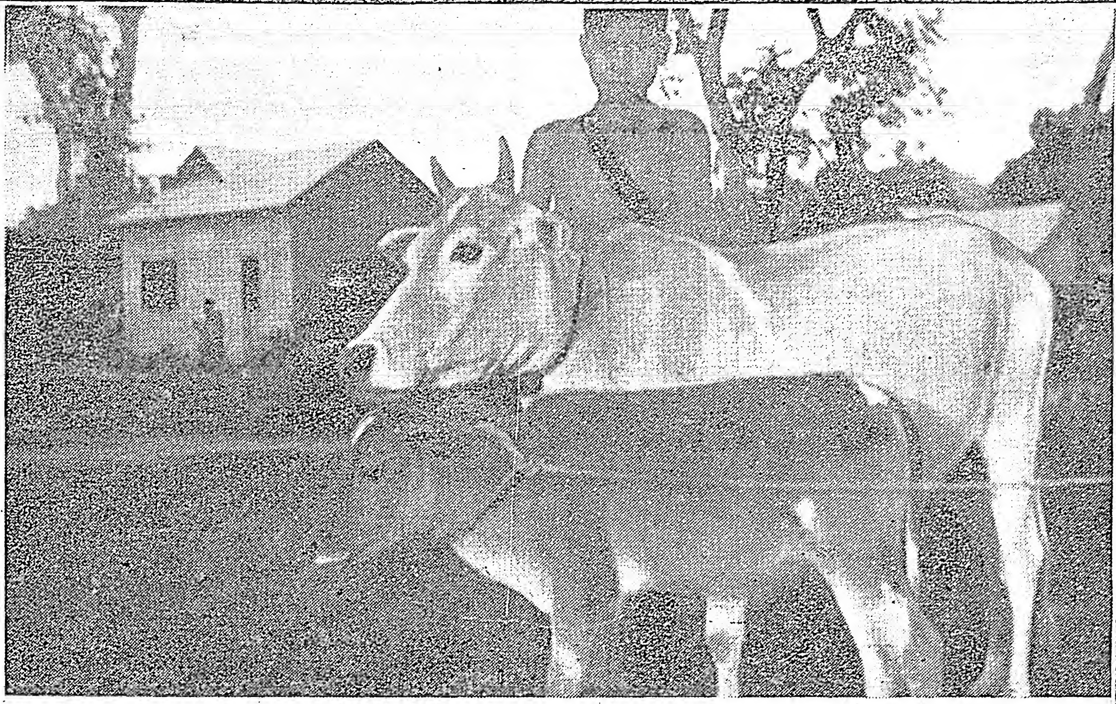


Making Hay



PROBLEM
ATTLE
SSAM

DE OSWAMI
search Scheme, Assam, Gauhati



A typical Assamese cow under balanced diet. She is giving 4 lb. of milk per day in the fifth month of her second lactation

therefore, considered that though there are sufficient areas as grazing reserves, it is doubtful whether cattle can get even half of their daily requirements by grazing alone for the major part of the year.

THE HILLS

The hills and the hill slopes are a perennial source of some robust types of herbage. According to researches of Talapatra and Das, some of these grasses are superior to most of the indigenous grasses of the plains of Assam even in mineral metabolism. Probably this is one of the reasons for the robust skeletal formation of the wild herbivora.

It is also generally noticed, that the domestic animals of the hilly regions are more or less superior to those in the plains specially in their draught qualities. This superiority may either be due to the effect of climate or the grazing. A careful survey, however, reveals that the hill fodders accessible to the domestic animals are not sufficient to cope with the all round demand for their proper nutrition.

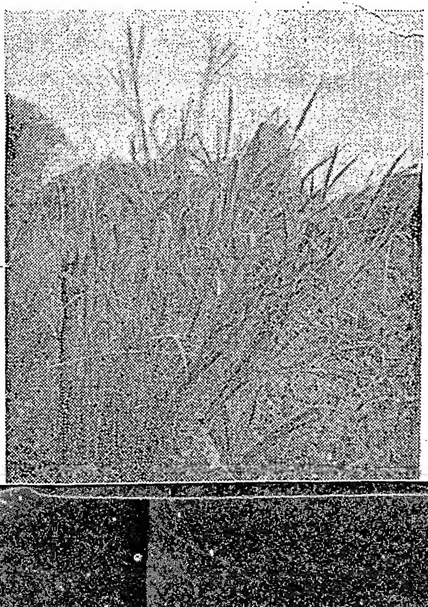
CULTIVATED FODDER CROPS

Cultivation of fodder crops in Assam is still in its infancy. It is practically limited to the Government farms and a few individuals. From statistics of 1949-50, it is found that out of the total cropped area of nearly 5.57 million acres, only 0.026 million acres are under fodder crops. Of this an area of about 0.025 million acres is cultivated in Lakhimpur district alone. Evidently, therefore, supply of cultivated fodders in Assam is negligibly small.

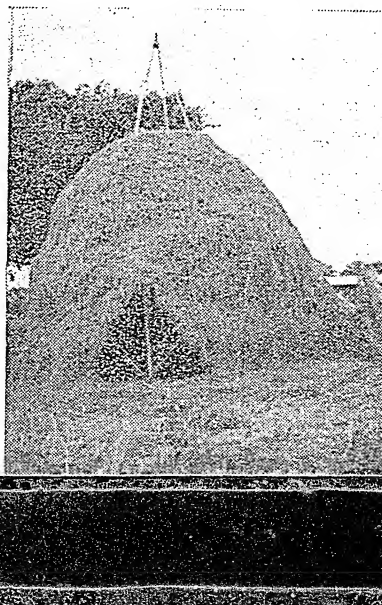
STRAWS AND RESIDUES

Paddy straw may be called the only roughage used occasionally for stall-feeding in this part of the country. Unfortunately, other straws and residues of maize, pulses, etc. are seldom used. The system of paddy harvesting prevailing in the State is rather peculiar. On an average, only one third of the paddy plants are cut. The rest are left behind in the fields. For this reason, the average out-turn of straws can be estimated at not more than 0.4 tons per acre and, therefore, the total available straw (including wheat) from the total cropped area does not exceed 2.0 million tons per year. Even if this whole quantity is made available for stall-feeding, it can only provide about 3.5 lb. of dry roughage per head per day to the adult cattle population leaving aside the entire young stock. But in practice, it is not so and a good portion of it is wasted in many ways.

HILL GRASSES
Right—'Kuchi' (Thysanolaena Maxima O. Ktz.)
Left—'Dhus' (Erianthus longisetosus Anderss ex Bth.)



PRESERVATION OF HAY
Tripod air-vent system



PRESERVATION OF HAY
Multiple air-vent system

Area under sugarcane in Assam is nearly 0.06 million acres. Sugarcane tops and leaves have been found to be a good roughage but they are not used by the people presumably due to ignorance.

CAKES AND BY-PRODUCTS

In the case of concentrates also, the position is far from being satisfactory. According to the agricultural statistics of Assam collected in 1949-50, the total area under rape, mustard, *til* (sesamum) and linseed is about 0.346 million acres and 4.4 million acres are under rice, maize and pulses. Area under wheat and barley is only 2,168 acres and may be considered negligible.

The cakes and by-products available from these can roughly be estimated at 0.35 million tons and even if the whole quantity is used as cattle feed it can hardly provide about 0.5 lb. of mixture per day per cattle for the growing, working and productive stock only. But, in practice, its use is limited and it is very difficult to ascertain the actual amount available as cattle feed after allowing for exports and imports. A considerable quantity of oilcake is also used as manure. By-products of rice and pulses are generally utilized in the dietary of poultry and pigs in the rural areas. The ignorance of rural people about the economic value of concentrates as feeds is also a great factor for their restricted use in the dietary of cattle.

The area under cotton in Assam is about 0.03 million acres; but unfortunately the seeds available have not been tapped as cattle feed in the State.

CONCLUSION

It is now evident, that the cattle in Assam are underfed. This brings about malnutrition with all its frightful after-effects. Improvement of cattle in Assam cannot be conceived of unless some measures are adopted for eradication of this malnutrition by adequate supply of nutritious food.

For eradication of this malnutrition, the first and foremost duty of the stock owners is to organize themselves and eliminate their invalid, inefficient and diseased animals. This will certainly minimize the overwhelming pressure on grazing lands.

If this is accompanied by genuine efforts to grow fodder grasses, to utilize indigenous grasses available in the country and to preserve monsoon grasses for scarcity periods, the deficiency in quantity and quality may be made up. Besides the stock owners should also divert their attention to feed their cattle with balanced rations —the basic principle for livestock improvement.

These rations may be divided into two parts—one for maintenance and the other for production purposes. The maintenance ration is just to enable the animal at rest to carry on the essential processes of life without either gain or loss of body weight.

Growing, working and milk-yielding animals require production ration over and above the maintenance ration. The additional ration for growth may be considered most important for livestock production because it is the foundation on which the other forms of production such as milk or work rest within certain hereditary limitations. If the growth of a young animal is retarded, it results into a permanent substantial loss of production to the animal itself and also to his or her progeny. Therefore, during the growth period, i.e. up to three years of age, animals should be supplied with adequate nourishment.

It may be suggested that a calf, five to six months old or even younger, should be fed with leafy fodders, preferably half dried or hay to appetite. From the age of four to five months, one-fourth pound of concentrate mixture properly soaked, should be added to the principal diet and its quantity should be increased at the same rate every four months till the attainment of an age of three years. The proportion of rice polish to mustard or *til* oilcake in the concentrate mixture should be 2:1 by weight.

It has already been stated that cattle are seldom stall-fed in Assam and that they mostly depend on grazing and due to poor conditions of grazing cattle are generally half-fed throughout the major part of the year. It should, therefore, be a bounden duty of the stock owners to supply necessary food at night in stalls so as to make up the deficiency.

A local Assamese cattle (adult) generally weighs about 400 to 500 lb. and hence its average roughage requirement per day is about 10 to 12 lb. of dried grass, hay or straw. In the case of green grass it is about 40 to 60 lb. depending on the moisture content of the grass. The above quantity is necessary when fed exclusively in stall and is sufficient to maintain an animal at rest. It should be noted that when paddy straw is used as basic roughage an addition of about 2 lb. of concentrate mixture is necessary for maintenance even. When grazing is allowed, the quantity referred to may be diminished to one-half and even to one-third taking into consideration the conditions of pasturage.

For production purposes, however, over and above the maintenance ration a concentrate mixture is to be given. Half pound of a mixture consisting of 2:1 rice polish to mustard or *til* oil cake for every one pound of milk yield per day is generally sufficient. The same quantity is also considered to be sufficient for a working bullock for every one hour of work.

PEPSU'S YOUNG FARMERS—

(*Contd. from page 20*)

Other activities of the clubs include recreation, sight-seeing, games, etc. In quite a number of clubs, the boys have formed *bhangra* parties (jolly singers). These things add life and colour to the activities of the clubs.

OTHER FEATURES

A flag has been adopted. It has a white back-ground with plough, yoke and the rising sun depicted in green and golden brown colours. The white back-ground denotes purity while the rising sun signifies 'the awakening.'

It was not considered advisable to depend much on private resources. Recourse was, therefore, taken to some Departmental Schemes for arranging supplies of ammonium sulphate, fruit plants, poultry and eggs, vegetable seeds, etc. at subsidized rates. Some help was also received from non-official organizations in the form of uniforms and badges for the members.

ANNUAL CAMPS

An annual camp was held sometime ago for four days. The main purpose was to place before the members a complete picture of the farmer's clubs and their activities. The boys clad in their uniforms took part in the various items of the programme such as games, group discussions, public speaking, etc. At the end, prizes were awarded to the best performers.

The experiment in Pepsu promises to yield good results. People are expected to have more faith in the new agency since it will offer opportunities for better bringing up of their children. It may possibly be adopted, therefore, as an integral part of the proposed Extension Service.

INDIAN FARMING:

SUBSCRIPTION.

Subscribers who have not renewed their subscriptions for the year 1953-54 are hereby requested to do so by remitting Rs. 9/- to the Agents at an early date.

Unless otherwise instructed you will continue to be a subscriber and will get the copies regularly.

In case we do not hear from you before 31st July, 1953, we will send the August issue by V.V.P. for the subscription due.

Business Manager,
INDIAN FARMING.

SEASONAL PESTS OF CROPS:

(Contd. from page 11)

During autumn and early winter there are only a small number of *Cucurbitaceous* plants in the fields and the few that are there are very heavily attacked. Naturally there is not enough food for all with the result that there is either heavy mortality or the individuals that emerge are undersized and weak. Emergence of the flies from pupæ takes place in the morning between 6-8 a.m. in summer and 9-11 a.m. in winter. Mating has not been observed during the course of the day but like other *Dacus* species, probably it takes place at dusk for a short period. It has a preoviposition period of 14 days in August. In summer the eggs are laid at any time during the day in shade but if there is no shade they are preferably laid during the evening hours. The number of punctures on the surface of the fruit made by this species is small and ranges from one to three. Eggs are embedded vertically or slightly slantingly and touching each other. They are sometimes laid in two or three planes. This, however, occurs when a number of flies use the same aperture for egg laying. The eggs are laid singly or in clusters of four to ten. Usually there are about a dozen eggs in each puncture the maximum number observed being ten dozens at a time when there was scarcity of host fruits. Compared to *D. ferrugineus* the number of punctures bored by this species is usually one and seldom exceeds three because the rind of the growing fruit soon becomes hard. The egg is white, cylindrical and slightly curved on one side. The incubation period varies from less than 24 hours in summer to six to nine days in winter. The larvæ that hatch out bore into the fruit and construct galleries. As many as 50 maggots have been bred from a single squash melon. Rapid decay of the vegetables is occasioned by the enzymatic action of the saliva secreted by the larvæ and aided by bacterial action. The maggots are full grown in about three days in summer to three weeks in winter depending upon the season and the rapidity with which the host plants decay as a result of the infestation. The full grown larva is cream coloured or pale white. It measures 9 to 10 mm. long and 2 mm. broad. The fully developed maggot leaves the fruit through one or two exit holes made in the fruit and pupates in the soil ½ to 6 ins. deep depending upon the nature of the soil. The prepupal period varies from less than 6 to 24 hours. The pupa is barrel-shaped and light brown in colour. The pupal period takes six to nine days in the rainy season, about three weeks in November and four weeks in December-January. The underfed pupæ measures 5 × 1.6 mm. and, therefore, the flies that emerge from them are also small. The female is easily distinguishable by the presence of a tapering abdomen ending in a pointed ovipositor. The adults live for one to two days without food. If properly fed on the juices of cucurbits the male was observed to live for 56 days and female 66 days during the monsoon months. The pest undergoes several generations in one year. As the broods take from 28 to 66 days to complete their life-cycle during the monsoon months, overlapping broods at this time of the year is the rule.

DACUS FERRUGINEUS

The fly popularly known as the mango fruit fly is distributed in our country from the Punjab to West Bengal in the north and Madras and Mysore in the south. Outside India it has been recorded from Pakistan, Ceylon, Burma, Siam, Java, Malaya, Mauritius, Philippines, East Indies, Amboina, China, Formosa, Bonin Islands and Australia. The fly attacks a wide variety of fruits and vegetables such as mango, guava, *loquat*, apricot, plum, peach, pear, wild fig, cultivated fig, apple, quince, persimmons, banana, *alubukhara*, *shalil*, pomegranate, sapota, sweet lime, *malta* orange, *santra*, pomelo, sour orange, chillies, American chillies, jack fruit, brinjal, and ripe bael. The damage caused to orchard and vegetable crops by this species is the most severe and varied. Although the internal symptoms of damage are slightly different in the case of the different fruits, the pattern of damage inside the pulp is more or less similar.

The fly has been observed to be active in the field almost throughout the year. Where there is a clear cut winter it enters into hibernation from the first week of November upto about the beginning of April in plains and June in the hills. If, however, the weather warms up

earlier the hibernation may end even in March or May as the case may be. The flies are observed flying about in orchards and kitchen gardens where fruits are grown. In the beginning of summer the damage caused by the fly is not severe but soon several broods complete their life-cycle in quick succession, the population increases and the intensity of attack as well as the damage also increases proportionately. It has a large number of deciduous fruits that grow and ripen throughout the summer to feed and breed upon. The population goes down from December onwards and thereafter the pest is observed only in its immature stages till the beginning of summer. Mating takes place at about dusk and lasts for about an hour. The preoviposition period may range from 10 to 15 days depending on the climatic conditions. The female lays eggs in small clusters just underneath the skin of the fruit 1-4 mm. deep in the rind. On an average about 50 eggs are laid but under favourable conditions as many as 200 eggs have been found to be laid. The incubation period is two to three days during March and April and a little shorter in summer months. In winter the incubation period is as long as ten days. The young larva is white, translucent and measures 1.5 mm. long. The full grown larva is 8 to 9 mm. long and 1.5 mm. broad. The larval period lasts from 6 to 29 days depending on the period of the year. The prepupal period ranges from 18 hours in summer to two days in winter. The pupa is cylindrical in shape and measures 4-5 mm. long and 2 mm. broad. Pupation generally takes place three to seven inches below the soil. The well developed flies are a little bigger than the ordinary house fly. The female is slightly bigger in size than the male and is marked with a tapering abdomen which ends in a pointed ovipositor.

DACUS ZONATUS

This species is only next in importance to *D. ferrugineus* in the severity of damage that it causes in the orchards. The pest has been recorded from Bihar, Madras, N. Coorg, Uttar Pradesh, Madhya Pradesh, Mysore, Bombay and the Punjab. Outside India it has been reported from W. Punjab, N. W. F. P., Baluchistan, Ceylon, Amboina and Egypt. The fly attacks a variety of fruits like peach, mango, fig, guava, sapota, *ber*, citrus, bael, bottle gourd, tomato, long melon, *tori*, brinjal and custard apple.

The adult flies remain active throughout the year except for a short period in winter from the beginning of January to the end of February. The pest overwinters mostly in the pupal stage. As, however, the flies have been observed under bushes during the winter months it is likely that this species also has a tendency to congregate under the leaves like *D. ferrugineus*. In spring the fly comes to activity earlier and has been bred from *ber* which is common then. Later on it is active causing damage to *loquat* and peach fruits in May and June. In the latter month it also breeds in cucurbit vegetables which are in plenty then. The monsoon months are passed in mango and gradually the damage is observed in guava, sapota, pomegranate, citrus, bael, etc. in the post-monsoon period. The pest is very active during the rainy months in summer when the population of the fly is at its peak. Life history of this species bears a close resemblance to *D. ferrugineus*. The preoviposition period is about 20 days and the female has been observed to lay about 137 eggs in her lifetime. The eggs are laid under the rind of the fruit in clusters of two to nine. The full fed larva falls on the ground and pupates in the soil.

CARPOMYIA VESUVIANA

This fly commonly known as the *ber* fruit fly has been recorded from almost all States in the Indian Union from the Punjab to West Bengal in the northern and Madhya Pradesh, Vindhya Pradesh, Madras and Bombay in the central and southern regions. Outside India it has been reported from West Pakistan, Dalmatia and Southern Italy. The nature of damage is almost similar to the other flies. The punctures on the fruits appear as dark spots when viewed from a distance. With the maggots feeding on the pulp inside, the whole fruit smells offensive.

The seasonal activity of this fly is in many ways different from the *Dacus* species. Contrary to the *Dacus* species the activity of this fly commences from autumn and continues through winter and spring.

It hibernates from April to August in pupal stage. The peak of damage done is in spring only in the months of February and March. The period of normal emergence of this fly synchronizes with the blossoming and formation of fruits in the *ber* tree. Two to three broods are present during one year depending on climatic factors. The fly is monophagous in habit and has been bred from *ber* fruits only so far. The incubation period of the egg is two to three days. The larva is full fed in seven to ten days. The full grown maggots cut one or two circular holes in the epicarp and come out for pupation. They are creamy white in colour and can jump to a height of six to nine inches covering the same distance at each jump to find a suitable place for pupation. Pupation takes place two to three inches in soil. Pupa is ochraceous in colour. The pupal stage lasts from a fortnight to over 300 days which is an extraordinary feature with this species. The shortest life-cycle from the egg stage to the adult stage is about 24 days.

CONTROL MEASURES

In no other family of insect pests the devising of control measures is so difficult as in the case of fruit flies belonging to the family Trypaneidæ.

CONTRIBUTORS ARE REQUESTED

to kindly submit two copies of all articles, notes, etc. intended for publication in **Indian Farming.** The articles should be clean-typed in double space on one side of paper, leaving a sufficient margin on the left-hand side. Contributions may be addressed to the Editor, **Indian Farming,** Indian Council of Agricultural Research, Jamnagar House Hutments, Mansingh Road, New Delhi 2.

Indeed in many cases the study of the biology of the insect offers some clue for their effective control. Some weak link in the life history of the pest is discovered and this is exploited by the economic entomologist. Here, however, the study of the biology of the pest offers no effective clue as the larvae live in fruits, vegetables, nuts, or in the buds of the growing plants and, therefore, any insecticide that may be applied in the form of dust or spray cannot reach them. The following control measures are recommended.

(*a*) All infested fruits should be promptly removed and buried deep in the soil. The layer of the soil over the infested fruits should at least be two feet deep. Otherwise some of the flies may escape.

(*b*) All undersized fruits or vegetables left over on the tree or plant should be collected as otherwise these become a source for further infestation.

(*c*) After the harvest of fruits in orchards or when the season for cucurbit vegetables is over, the soil in the orchard or kitchen garden should be given a light ploughing. By adopting this simple cultural practice the pupæ of flies are exposed and fall a prey to parasites, predators and birds. A large number of pupæ are also destroyed by mechanical injury inflicted during the ploughing operation.

(*d*) The flies are attracted to the smell of certain essential oils like Citronella oil. The dosage that is recommended is ten drops in a pint of water. The flies that are attracted by the oil are collected and destroyed. A proprietary product called 'Clensel' has given encouraging results in certain regions in atracting large numbers of male and female flies.

In nature the population of these flies is kept in check to some extent by the activity of some species of hymenopterous parasites. These parasites are more or less constant factors in the life history of these flies, and but for their activity the infestation of these flies in the orchards and kitchen gardens would have been far more severe than what it is today.

CASHEWNUT—A Dollar Earning Crop of India (*Contd. from p. 17*)

SOIL

Cashew is a very hardy and drought resistant plant thriving under diverse soil and climatic conditions. Its performance is of the best in the vicinity of the sea on the lateritic hill slopes of the West Coast which receive an annual rainfall ranging from 120 to 130 inches. It fares satisfactorily on the sandy soils of the east coast under a moderate annual rainfall of 35 inches. The crop has been extended in recent years into the hinterlands as far in as 100 miles from the sea, where it is seen to grow and crop well on sandy soils.

VARIETIES

There are no named varieties. Because of seed propagation, the cashew exhibits immense variation in respect of economic characters such as yield, shape, colour and size of the nuts, as also the shape and colour of the apples. One of the important directions in which improvement of the crop lies is to make a comprehensive study of these differences, distinguish the good from the bad or uneconomic types and restrict further propagation of trees from only the former.

PROPAGATION

The tree is usually grown from seed at present. Trials at Fruit Stations in Madras State have shown that layering, budding and grafting methods of vegetative propagation are also feasible. These methods have to be standardized in regard to the details and the optimum periods for the operations have to be determined. When these are accomplished it will be possible to register appreciable increases in crop yields of the future plantations.

CULTIVATION

The usual practice of cultivation in the West Coast is as follows:

The nuts are sown directly in their permanent site after the first few rains of the monsoon, digging small holes for the purpose and sowing two or three seeds in each. The seed rate works out to about 2 lb. per acre. After germination, only the vigorous seedlings are retained with not more than one in each hole. In some parts of Malabar, the nuts are first sown in baskets woven out of palmyra leaf and in about a month, the seedlings with their containers are planted out. No regular spacing of any kind is adopted but on an average about 100 trees go to the acre. The cotyledons of the young germinating seedlings prove a great attraction to birds and rodents. Protection to the plants is generally given by enclosing them within thorny hedges. The trees are neither manured nor irrigated at any time of their life.

The cashew tree commences to bear from the third or fourth year after planting and attains full bearing age in the tenth. The economic life of the trees varies widely from 20 to 40 years depending upon the location and soil. The flowering season commences with November and extends upto February and the fruit ripens from March to May. The crop is generally harvested when the nuts are mature but before the apples are tree ripe and fall to the ground. The well filled but immature nuts are also harvested by some growers to meet local demand and in some cases to curtail the watching period. An adult tree is capable of yielding even up to 100 lb. of mature nuts per annum though the average on the west coast is reported to be only about 20 lb. and in the eastern districts of Madras about 30 lb. and in Orissa about 40 lb. per tree.

PROCESSING

The nuts soon after harvest are dried in the sun for a few days and then they are roasted. The shell oil that is exuded during the roasting process is collected separately. Oil bath processes aiming at quick and uniform roasting and high recovery of oil have recently been patented by some firms. After roasting, the nuts are shelled. The outer skin of the kernels is peeled and the kernels intended for export are packed in vacuum.

Each tree produces about 75 lb. of apple and the annual production of apples in India is estimated to be of the order of 55 lakhs of maunds. But of this, except for a very small proportion, the rest goes largely to waste. The juice extracted from the apple does not keep well and deteriorates rapidly unless sterilized by heat or treated with preservatives. A fairly good syrup from this juice has been prepared at the Government Fruit Products Research Laboratory at Kodur and its extended use deserves to be popularized. Since the raw juice is rich in sugar, it can also be utilized for the production of alcohol.

MARKETING

It is the common practice for itinerant merchants to buy the produce in small lots from the growers, pool it and then dispose it of to the processing factories. Owners of the bigger cashew holdings lease out the usufructory rights to the merchants at the commencement of each season.

PESTS AND DISEASES

Dark brown thrips are known to cause damage to tender leaves and flowers in North Malabar. Bats carry away whole fruits with nuts. Birds and squirrels attack the ripe fruits but the nuts are generally dropped down. The only serious disease seems to be the die-back which is particularly bad in neglected plantations or those raised on very shallow stony soils.

IMPROVEMENT WORK

No systematic work for the improvement of the cashew has so far been done anywhere in the Indian Union. At the Fruit Research Station, Kodur (Madras State) where nearly 100 seedling trees have been grown as windbreaks and at the Agricultural Research Station at Nileshwar and Taliparamba a few observational trials were undertaken. These have helped to bring out the wide diversity in apple and nut characters as also in the yields between individual trees, and have served thereby to emphasize that for any radical and quick improvement, building up of clonal strains by vegetative propagation of promising types is about the best course. Other concurrent lines of improvement would include blossom biological studies to determine the true features that ensure the maximum crop, determination of simple methods of top-working unthrifty trees to superior ones, devising means of profitable utilization of the by-products, chalking out effective means of prevention and control of pests and diseases and standardization of marketing methods. A scheme for the improvement of this crop has recently been sanctioned by the Indian Council of Agricultural Research and the land for the establishment of a research station has also been acquired near Mangalore in South Kanara district. Under this scheme which is expected to be put into operation soon, the problem of improvement of the cashew has been reviewed from different angles to meet the several objectives outlined above.

INDIAN FARMING

Vol. III New Series No. 5 August 1953

EDITOR'S PAGE AND EDITORIAL NOTES 2
MAN OF THE MONTH (Feature Article)—Harkirat Singh 4
SOME MAJOR INSECT PESTS OF RICE AND THEIR CONTROL —E. S. Narayanan 8
HAND OPERATED MARKERS FOR TRANSPLANTING RICE —R. V. Ramiah 14
PLANT HORMONES—C. L. Hamner and G. S. Rai 16
DYSENTERY 20
'MARBLE' DISEASE OF CARDAMOM —P. M. Varma and S. P. Capoor .. 22
GROW MORE SWEET POTATOES —H. B. Singh 24
GREAT POTENTIALITIES OF SESBANIA SPECIOSA—R. M. Savur 28

★

EDITORIAL BOARD

Printed and published by P. H. Raman at the Associated Advertisers and Printers Ltd., 505, Arthur Road, Tardeo, Bombay 7.

(Agents for Indian Council of Agricultural Research, New Delhi.)

ADVERTISEMENT RATES

CURRENT:
CASUAL

Full Page	Rs. 450/-
1/2 Page	Rs. 225/-
1/3 Page	Rs. 150/-

CONTRACT CONCESSIONS:

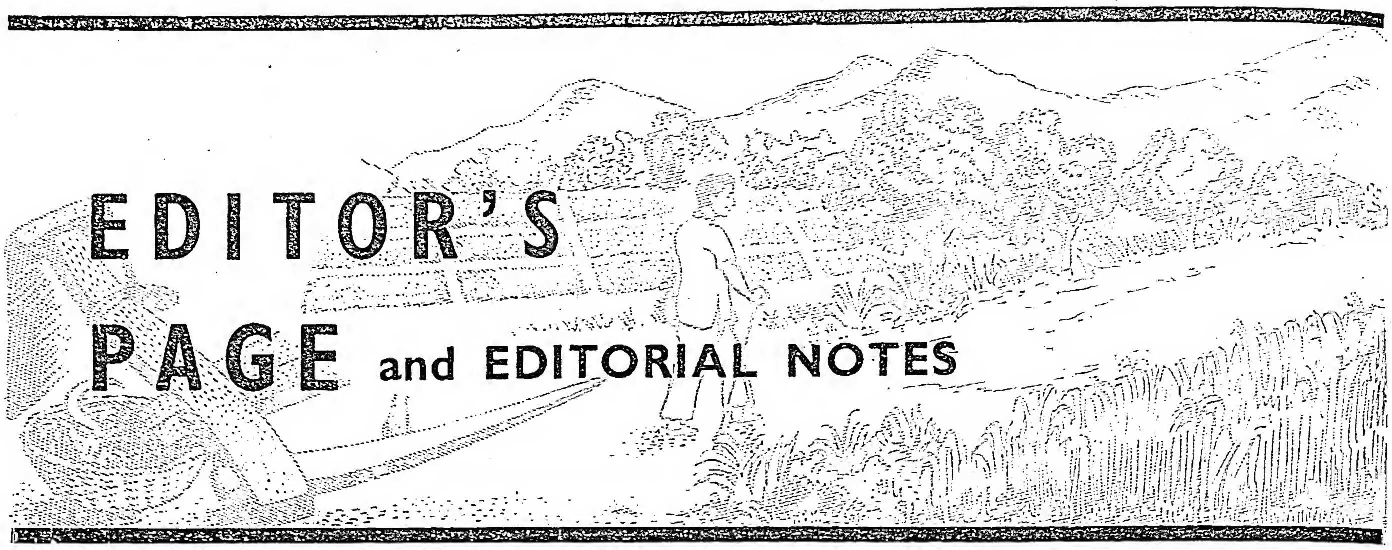
6 INSERTIONS	12 INSERTIONS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

Effective from October 1952 until further notice.

SUBSCRIPTION RATES

Annas 12 only per copy
Rs. 9-0-0 for 12 issues
Rs. 4-8-0 for 6 issues.

All Business enquiries may be addressed to the "Agents" at 505, Arthur Road, Tardeo, Bombay 7.



EDITOR'S PAGE and EDITORIAL NOTES

It is a happy sign of times that more people are thinking about tree plantation. Trees are a part of the nation's wealth ; in many ways they are connected with the economic prosperity of the people. It will be superfluous to stress their importance in productive spheres. It is, therefore, reasonable to assume that a country without any rich tree flora will be handicapped in numerous ways in following a progressive programme of economic development.

It was in the year 1950 that the Vana Mahotsava or tree plantation ceremony was inaugurated on a national scale for the first time in this country. This celebration focussed public attention on and made the people conscious of the usefulness and the immense possibilities of tree flora. It is hardly necessary to dilate on the various benefits that are derived from trees in the shape of timber, fuel and other essential articles of daily use. Evidently, a land with considerable tree flora has much more economic possibilities than the one without such vegetation.

Quite apart from the utilitarian point of view, trees have long been appreciated from aesthetic point of view. Beautiful trees, trees with coloured and odorous flowers, trees planted in stately avenues have long been prized and appreciated.

The point that needs special emphasis is the considerable moderating influence that trees exert on the climate of a country. It is also a common knowledge that a land with a luxurious growth of trees exhibits a greater degree of fertility than a barren tract and is less exposed to the ravages of soil erosion. Moreover, the leaves of trees and forest litters may be composted into manure to be used in crop production. A barren land is too often prone to visitations of famine and pestilence.

It is admitted that trees must necessarily be cut down for various purposes. But this might not seriously reduce the tree population to any considerable extent if some definite, well-thought-out plan is followed so that for each tree felled, provision is made for another to take its place. Unfortunately, there has been a wanton destruction of trees in this country for many a long year. This should be prevented by all possible means. Any purposeless felling of or causing damage to trees should be looked upon as an unsocial act. This way of thinking should be inculcated in every grown-up citizen and it is by so doing that protection may be ensured to the country's tree flora.

In 1950, the year of the inauguration of Vana Mahotsava in this country over 4,00,00,000 trees were planted. Of these 38 per cent survived. During the next two years an equal number of saplings was planted and the percentage of survival rose to 53 per cent as against 38 per cent in the previous year. This should

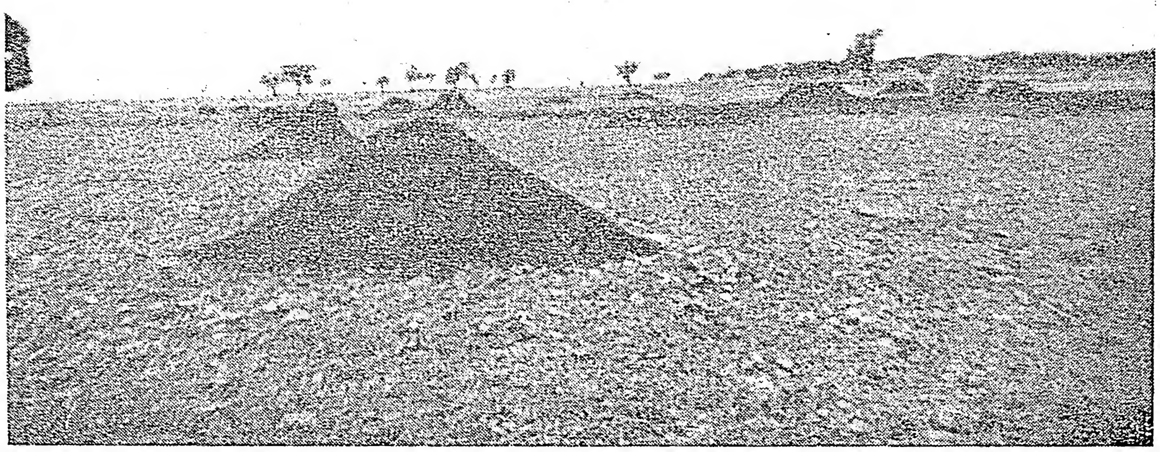
be looked upon as a considerable improvement and should satisfy and convince the pessimist.

There has been a great deal of enthusiasm and healthy rivalry among as well as cooperation between different organizations in implementing the programme of tree plantation. Various public bodies such as Government offices, universities, municipalities and other similar organizations have evinced keen interest in the programme and have taken to tree plantation in right earnest. In order to promote this spirit and to sustain the movement of tree plantation, the Government of India have instituted a scheme of awards of shields and rewards to the village, district or other organizations which exhibit the best accomplishment in this field. The institution of these prizes is a step in the right direction as it creates enthusiasm for and competitive spirit in the plantation of trees.

This enthusiasm of the people should preferably be channelised in order that the country may derive the best advantage. Instead of mere haphazard plantation, tree planting should be planned in an organized manner according to a set programme. If the enthusiasm could be channelised so as to bring about afforestation of all the available bare lands, it would be of much benefit to the country. Not only land at the disposal of Government, but land belonging to other organizations and even private land may be utilized for tree plantation. If this was done, not only would it lead to increase in fertility or restoration of fertility, but it would also enable villagers to draw upon a source of fuel offered by the trees so planted. This would also yield a larger quantity of leafy fodder and a greater amount of leaves and forest litter for composting. The latter would inevitably save cow dung which is now being used in the villages for purposes of fuel. An extensive tree cover would save the soil from erosion and prevent formation of *gullies*, because the root system helps the surface rain water to sink into the sub-soil. A reference may be made in this connection to the laudable work which has been undertaken to prevent the advancing march of the Rajasthan desert into the Gangetic plains by planting tree belts. Steps have also been taken to plant the desert itself with suitable trees. It may be hoped that the attempt will be successful and the barren desert will become clad with green trees.

★

MAN OF THE MONTH



Compost being applied to the fields

By

HARKIRAT SINGH

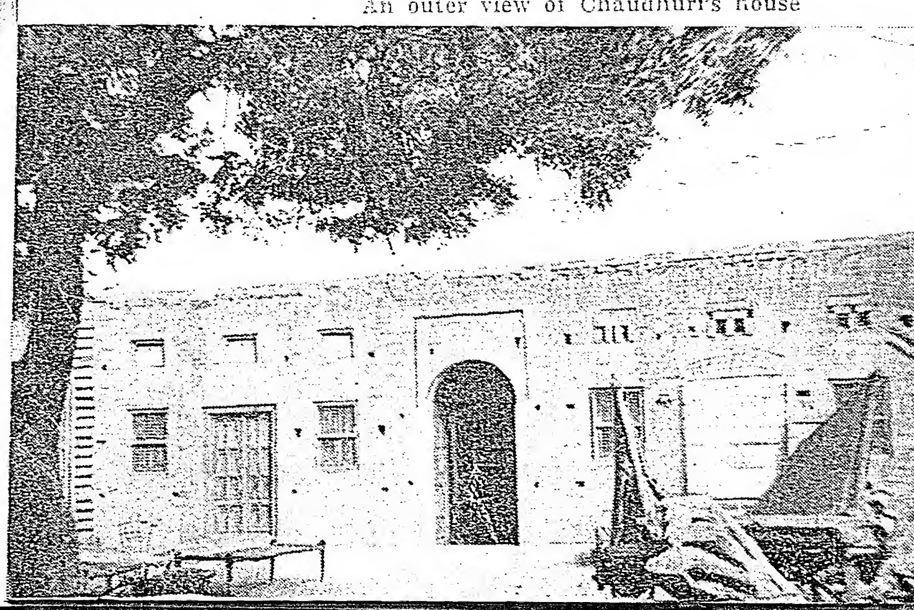
LAND MUST BE ADEQUATELY FED, says CHAUDHURI S

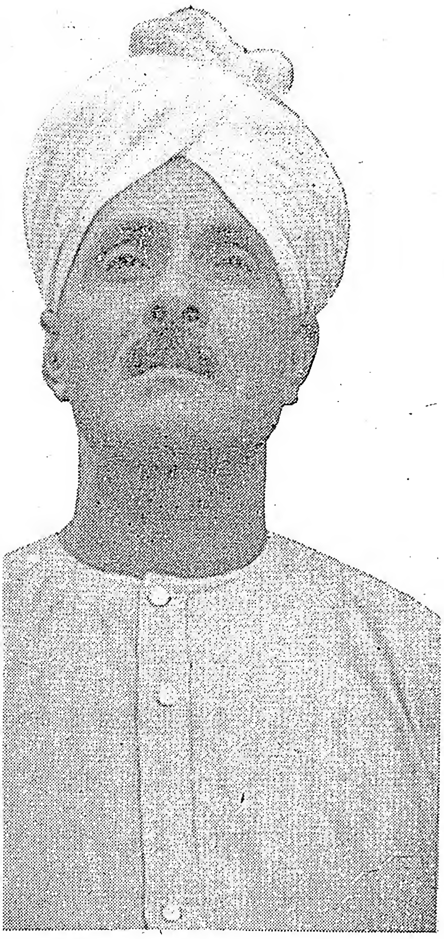
IT was an unusually cool summer morning in June this year, when I met Chaudhuri Sham Lal of Pritampura. Situated at a distance of about eight miles from Delhi, this small village today has the distinction of possessing a very progressive farmer in Chaudhuri Sham Lal, who is the winner of the first prize in wheat in the Delhi State Crop Competition held in the *rabi* season in 1951-52. As against an average yield of 15 maunds per acre, he produced 52 md. 3 sr. 7 ch. of wheat from an acre.

As soon as one sees this 48-year old farmer, one has a feeling that he knows the land and its problems intimately. After successfully completing a two-year agricultural course at the Agricultural College, Lyallpur, in 1930, he straightaway took to farming as a profession. He also assisted his father in various agricultural operations and gained from his wide experience and wisdom. At present, he can confidently depend upon his own judgment and his brothers and sons look to him for guidance. He owns 250 *bighas* (50 acres) of land in joint partnership with his elder brother, Chaudhuri Het Ram, and three other brothers, and three sons help him in making his profession a profitable employment.

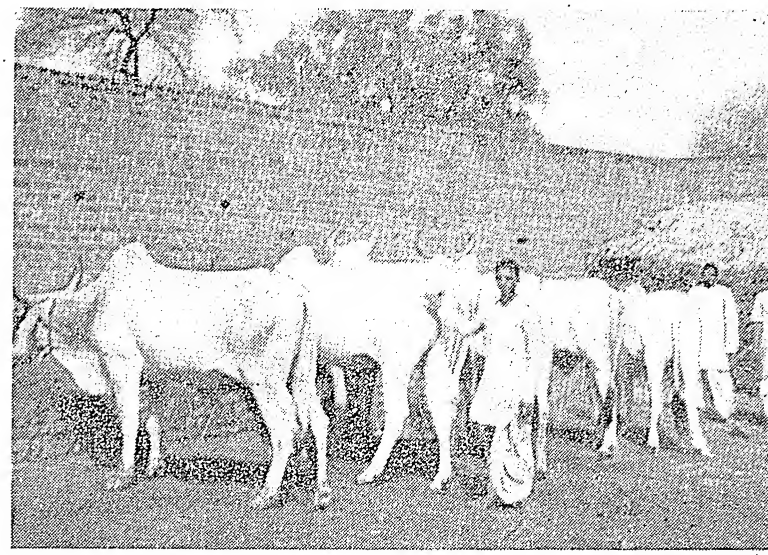
When questioned as to how he had obtained such a high yield from his land, he promptly said, "*Zamin ko pait bhar kay khana aur peenay ko pani chahiye; main dono deta hoon* (The land wants enough to eat and water to drink; I provide it both)." During the course of our talk he revealed to me that the

An outer view of Chaudhuri's house





Chaudhuri Sham Lal



The Chaudhuri's cattle yard

HAM LAL

key-note of his success was a liberal use of manures of every kind—green manure, compost, fertilizers, etc. He well appreciates the value of dung and does not burn it. All the dung that he gets from his six bullocks, two camels, two buffaloes, one horse, one cow and a calf goes into the making of compost for his land. He also purchases a good amount of compost from the municipal corporation for his use.

Though a major portion of his land is irrigated by the Western Jamuna Canal (Delhi Branch), to guard against any possible water shortage, he has set up four Persian wheels. At the time of my visit, one of them was in action and about four acres, in which he proposed to raise vegetables like brinjals, tomatoes, sweet potatoes, carrots, turnips, etc. for the market, were under irrigation. Certain other portions of his land, which were littered with little mounds of compost, gave me a preview of the smiling fields that he was sure to raise by dint of his hard work and long experience.

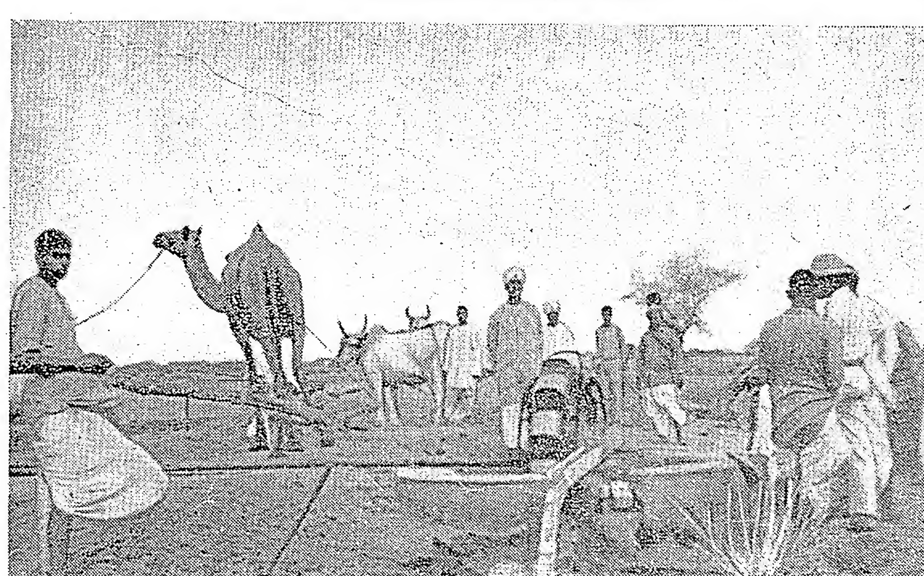
METHODS USED

On the plot of land on which he grew wheat for competition, he told me, gram was sown in *rabi*, 1950-51. The land, which is loam, was then ploughed twice in the following *kharif* and *guara* was sown for green manuring. *Guara* was ploughed in about middle of September and the land was left as such for nearly 20 days, after which one irrigation was applied. Seven ploughings were given in the month of October at intervals of three to five days. Then superphosphate at the rate of 20 seers per acre was worked into the soil with one more ploughing.

Wheat C. 591 was sown in the first week of November; seed at the rate of 35 seers per acre was used. This seed had been multiplied by Chaudhuri Sham Lal himself at his farm since 1948, when it was first supplied to him by the Departmental authorities at Delhi, who had in turn procured it from the Department of Agriculture, Punjab (India).

When the seedlings were about five to six inches in height, *rauni*, i.e. first watering was given which was followed by interculturing with a bar harrow. Two more waterings were given in the month of January and another one was given at the time of grain formation about the end of February. In all two weedings were done and the crop was harvested in the month of April.

A Persian Wheel in action



ECONOMICS OF COMPETITION PLOT

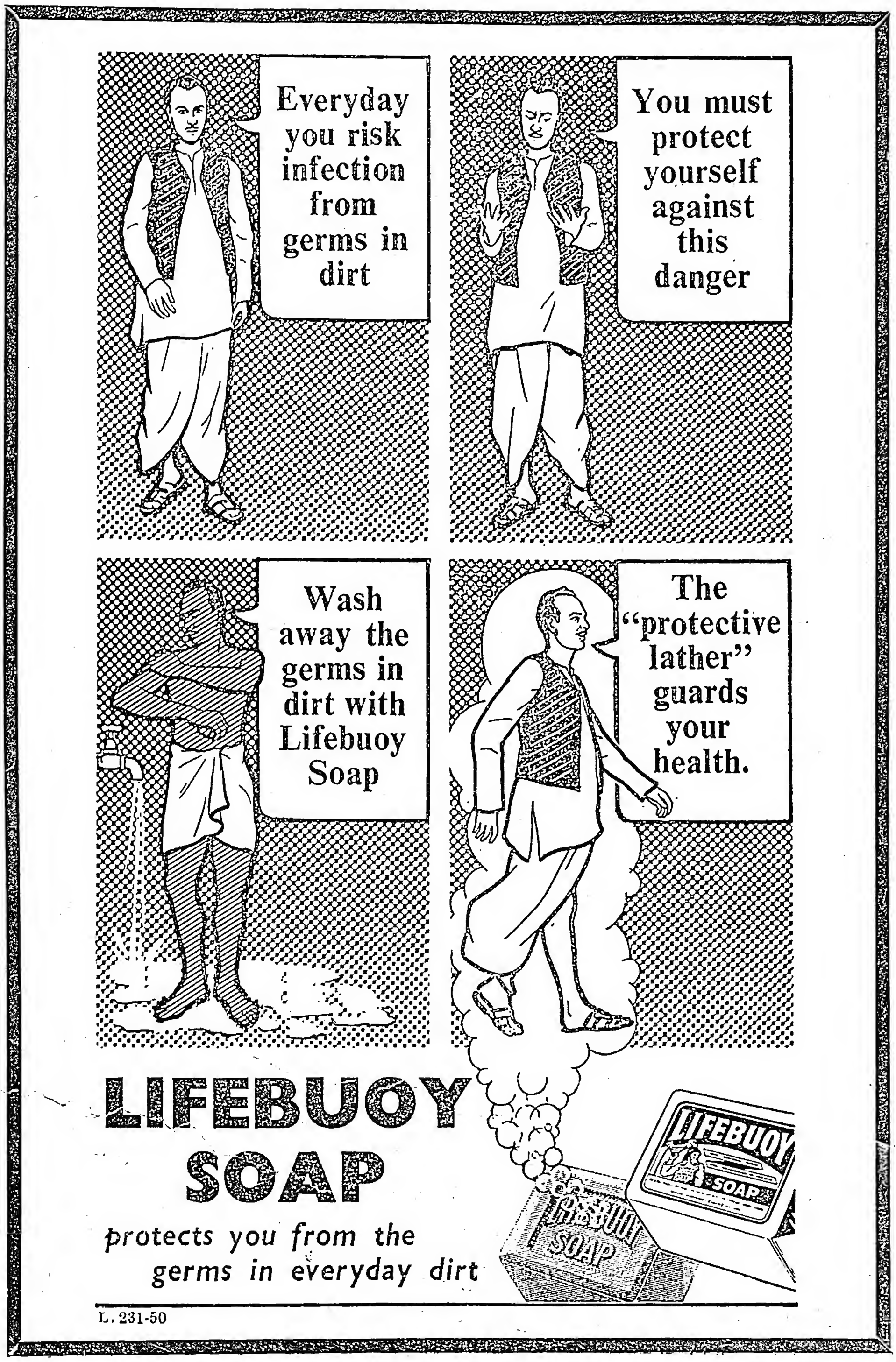
Not only has the Chaudhuri earned a name for himself among the farming community of the Delhi State by raising such a huge crop of wheat on his 1.7- acre piece of land, but he has also made a good profit from the sale of wheat and *bhusa*. The total expenses which included cost of ploughing, irrigation, manures and fertilizers and the wages paid to casual labour employed for interculturing, weeding, harvesting, threshing, etc. came to Rs. 512-2 as against a sum of Rs. 1,004-13 realised from the sale of wheat and *bhusa*, leaving him a net profit of Rs. 492-11. Besides, he got a cash prize of Rs. 450 from the Delhi State Agriculture Department. The Chaudhuri is a very practical man and does not cling to the calling of his ancestors because he was born in a family of the farmers; he visualises that farming is a paying proposition which can provide him with "enough and to spare."

FUTURE PLANS

The greatest handicap he was suffering from was, as he told me, the division of his land into many small pieces, no less than 15 in number, with sizes ranging from 0.5 acre to 8 acres. He was, however, hopeful on account of the fact that the Government had initiated the programme of consolidation of holdings. He expects that in the not distant future he will have plots big enough to permit mechanical cultivation. "Only then my dreams will be realised and I will show you something more impressive if you happen to visit my farm at that time," he said enthusiastically and visibly moved.

After consolidation of his land he plans to initiate large scale farming business in collaboration with one of his friends who is also a landowner. He is strictly in favour of raising cash crops for, as he puts it, they yield handsome profit and, therefore, provide more incentive for hard work.

Chaudhuri Sham Lal plans his crops from the point of view of business. "Last year," he said, "fodder was paying; so I grew it. This year the vegetable market is up; hence I am growing vegetables."


Everyday you risk infection from germs in dirt
You must protect yourself against this danger
Wash away the germs in dirt with Lifebuoy Soap
The "protective lather" guards your health.
LIFEBUOY SOAP
protects you from the germs in everyday dirt
LIFEBUOY SOAP
L. 231-50

SEASONAL PESTS OF CROPS:

By
E. S. NARAYANAN,
Head of the Division of
Entomology, I.A.R.I. New Delhi

RICE is the staple food of the teeming millions who inhabit the south, south-eastern and far eastern Asia and Japan. The health and well being of this vast population indeed even their survival depends upon a generous and bountiful supply of this cereal. In the Indian Union rice is an essential article of diet of most of our people especially in Kashmir nestling in the Himalayas in the north, Assam, Bengal and Orissa in the east and Madras in the south. Rice has an unusually large number of insect pests that take a heavy toll of the crop year after year. Ours is a country where at present there is a shortage of cereals of all kinds especially rice. So the extreme urgency of reducing the damage caused by these insect pests to the minimum by modern scientific methods to maximize production needs no emphasis.

Although more than fifty insect pests have been observed and recorded in the Indian Union as causing damage to rice in the field only seven can really be classified as major pests. Three more appear sporadically in some years and by causing serious damage assume the status almost approaching a major pest. So in the following pages the former are dealt in some detail and a brief and passing survey made of the latter.

The seven major pests are the following :—

(1) The rice stem borer (*Schaenobius incertellus*, Wlk.)

(2) The rice seedling borer or the rice swarming caterpillar (*Spodoptera mauritia*, Boisd.)

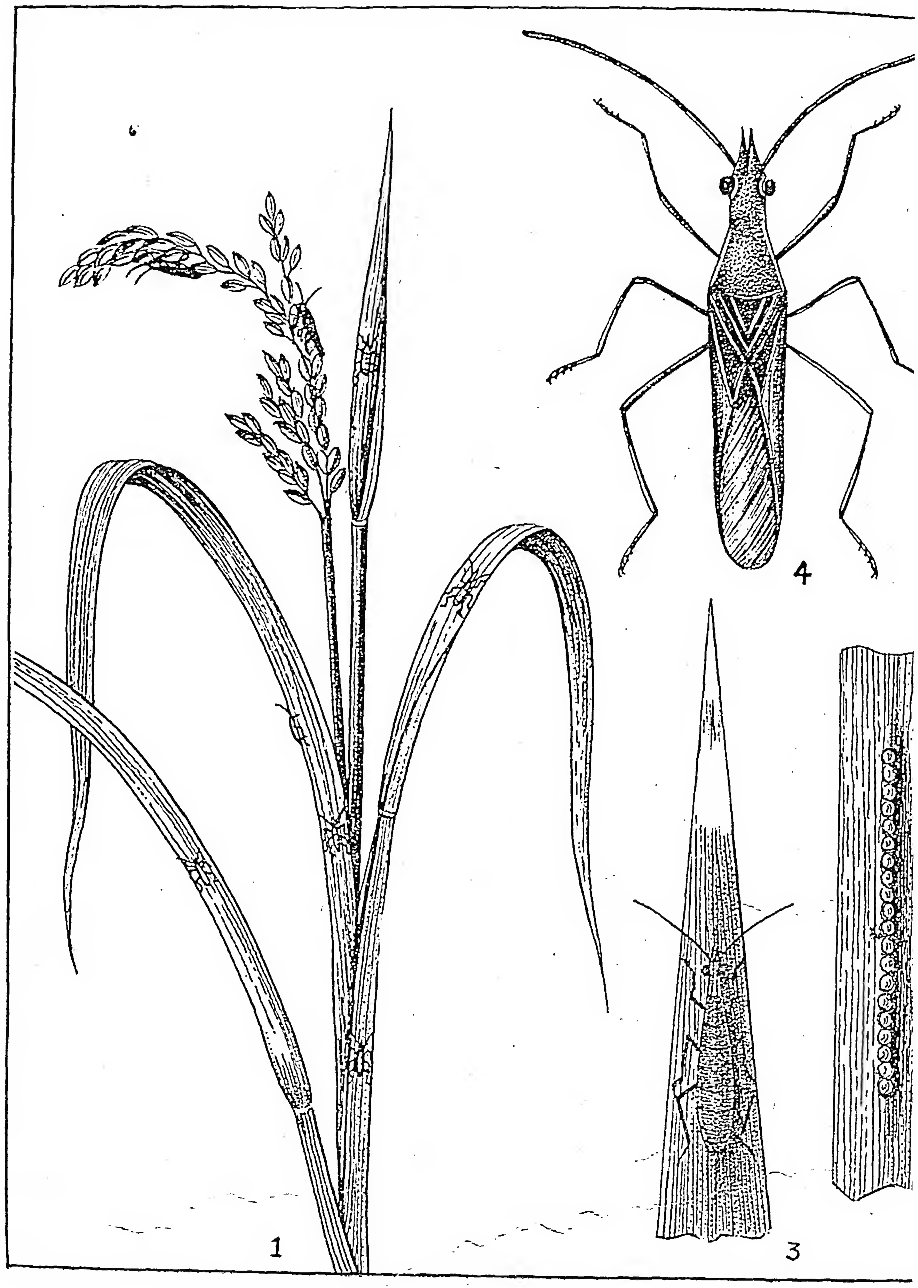
(3) The paddy cut worm (*Cirphis unipuncta*, Haw.)

(4) The paddy bug or the Gundhi bug (*Leptocorisa varicornis*, Fabr.)

(5) The rice grasshopper (*Hieroglyphus banian*, F.)

(6) The rice hispa (*Hispa armigera*, Ol.)

(7) The paddy gall-fly (*Pachydiplosis oryzae*, W.)



LEPTOCORISA VARICORNIS, Fabr.
1. Rice plant with the nymphs resting on the leaves. Some adults are attacking the grain
2. Egg cluster
3. Half grown nymph
4. Full grown bug

The following are the three pests that in some years assume the status of major pests.

(1) The small paddy grasshopper (*Oxya velox*, Fb.)

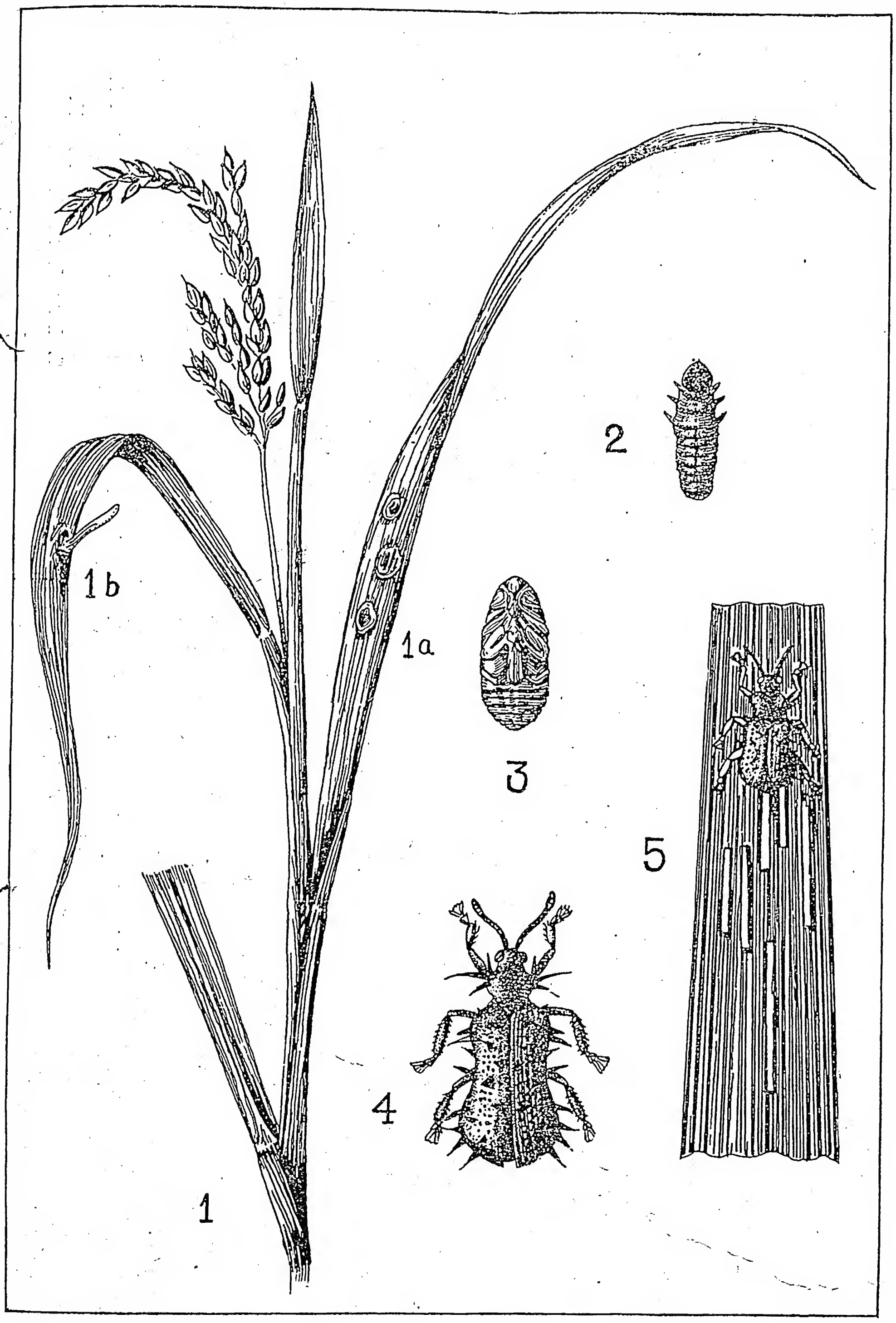
(2) The paddy leptispa (*Leptispa pygmaea*, B.)

(3) The paddy jassid (*Nephotettix bipunctatus*, Fabr.)

RICE STEM BORER S. Incertellus

This is a specific and by far the most serious pest of rice that occurs

PESTS of RICE and THEIR CONTROL

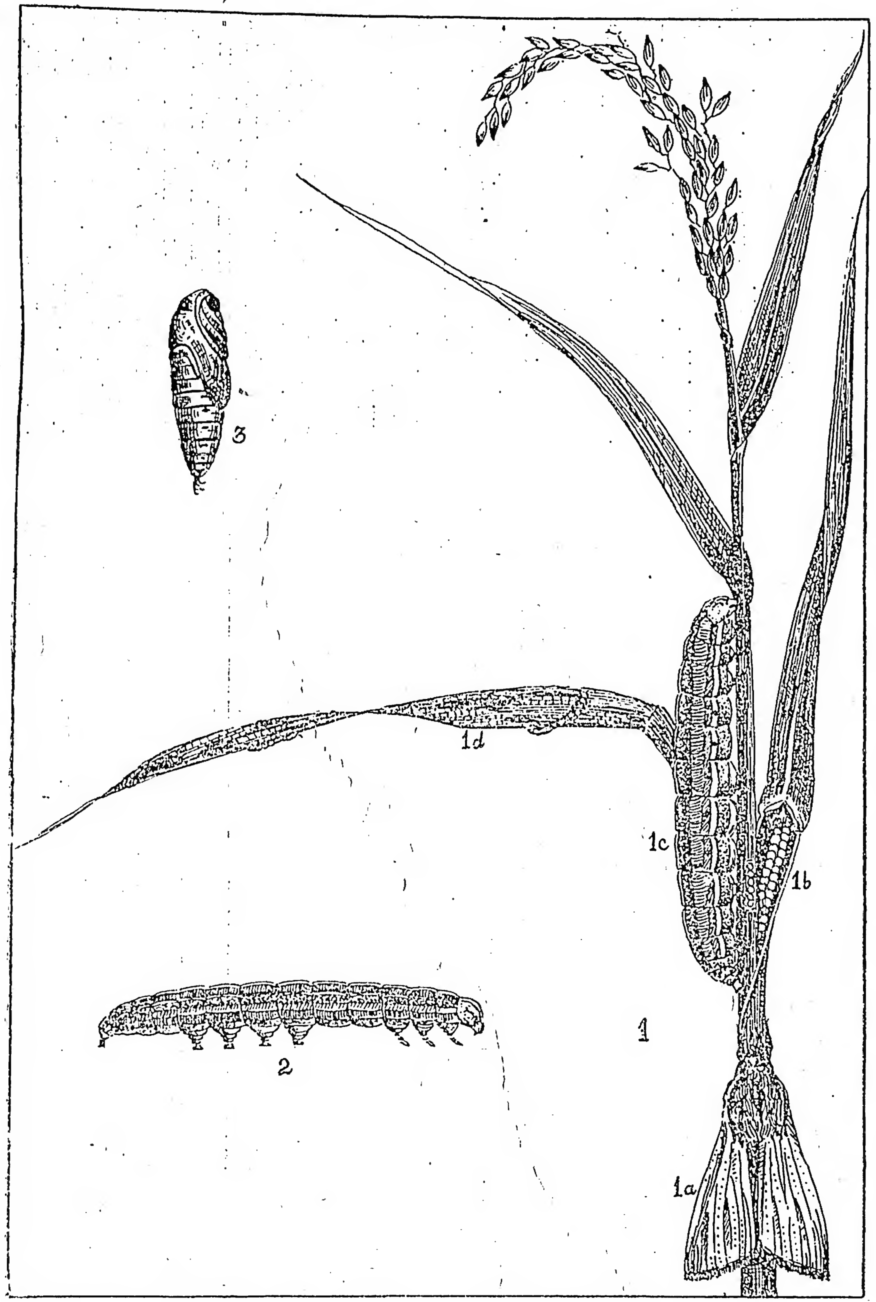


HISPA ARMIGERA, Ol.

1. Rice plant showing the eggs inside leaf (1a) and grub inside leaf (1b)
2. Full grown grub
3. Pupa as seen from below
4. Adult beetle
5. Adult beetle in the process of damaging the leaf

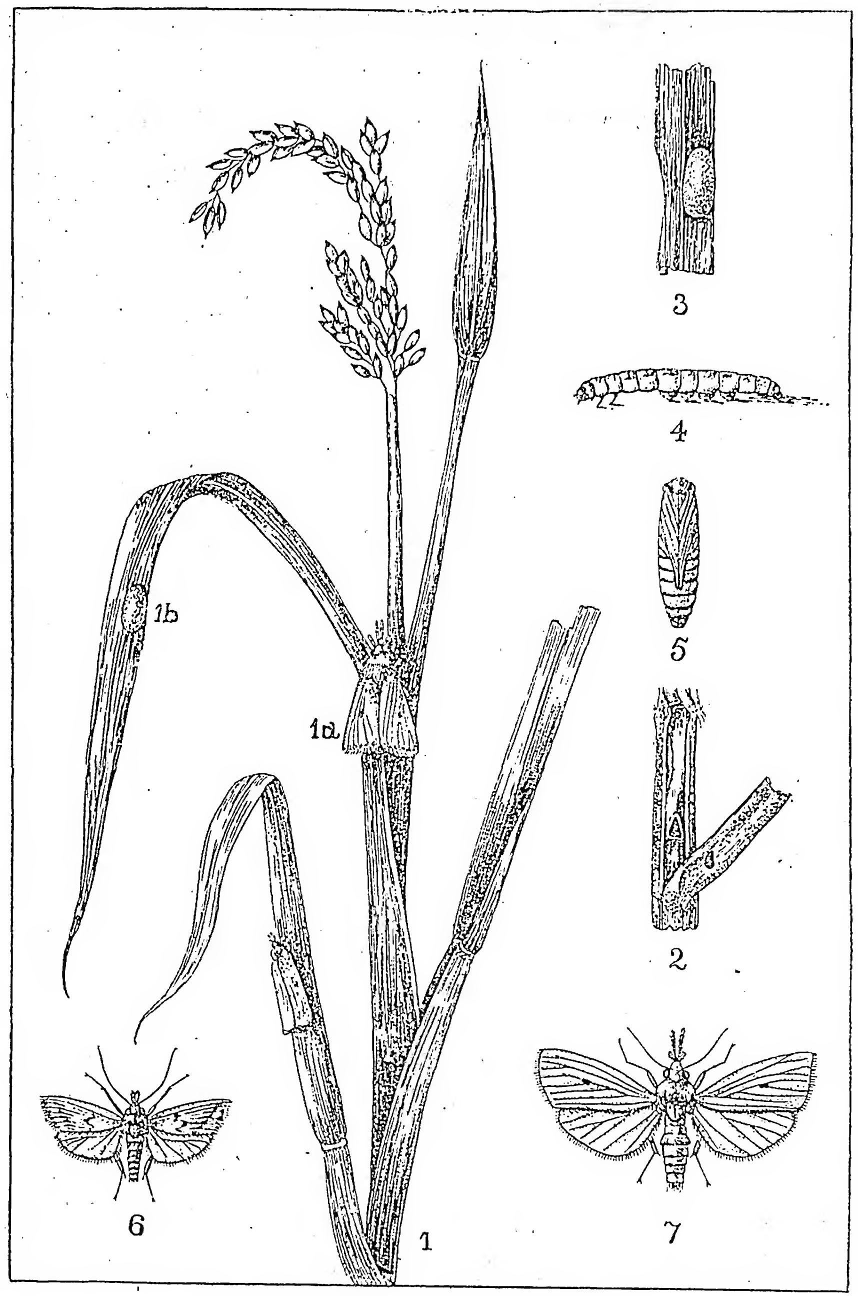
in all the rice growing tracts of the Asian main land and Japan. This is commonly known as the number one enemy of rice in Asia. In the Indian Union the loss caused by this pest to the rice crop is valued at about one hundred million rupees annually. The caterpillar bores into the stem of the paddy plant and as a result of its attack the central shoot withers producing the characteristic white 'dead heart'. Presence of white ears also indicates the infestation by the pest in the advanced stage of the crop. The pest is active from about March to October or the middle of November after which it hibernates in larval stage till about March next year. Where there is no clear cut winter, the moths emerge earlier. From March to June the moths breed on thick wild grasses that grow either in the bunds or in some places near the paddy field. From June onwards they lay eggs on the leaves of the rice plant. The eggs are laid in clusters of 60 to 100 eggs. Sometimes the number may be as high as 200 in a cluster. The eggs are generally laid on the leaf tip by the side of the mid-rib. The moths that are light yellowish-straw in colour prefer shady parts of the field for the purpose of egg laying and the eggs are generally laid at night. The eggs hatch in five to six days and the tiny larva on hatching first feed on the epidermis of the leaf and later after about a day it bores a hole into the stem and feeds inside. The full fed larva measures about an inch in length and pupates within the stem under a light white silken cocoon. The larval period occupies about a month. From the cocoon the moth emerges after about ten days. The total life-cycle from the egg to the adult stage occupies from six to seven weeks.

Control measures : The control of the paddy stem borer is one of the most difficult and baffling problems in applied entomology. Economic entomologists have not been able to evolve an effective method of control of this serious pest. Many countries notably Japan have sent their entomologists to other rice growing countries to collect beneficial parasites if any with a



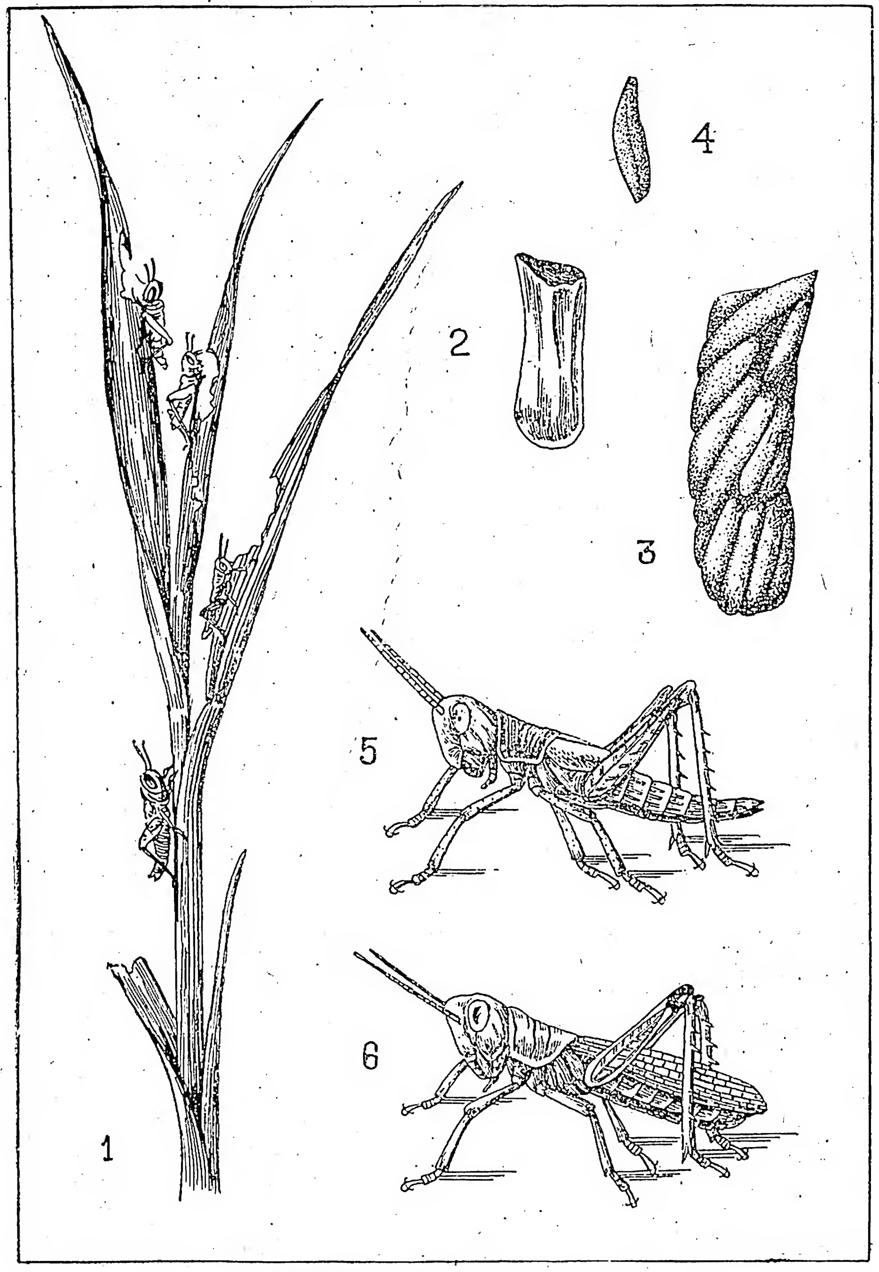
CIRPHIS UNIPUNCTA, Haw.

1. Rice plant showing the infestation by the pest in different stages —1a—the moth resting, 1b—Egg cluster, 1c—and 1d—larvae feeding on stem and leaves
2. Full grown larva
3. Pupa



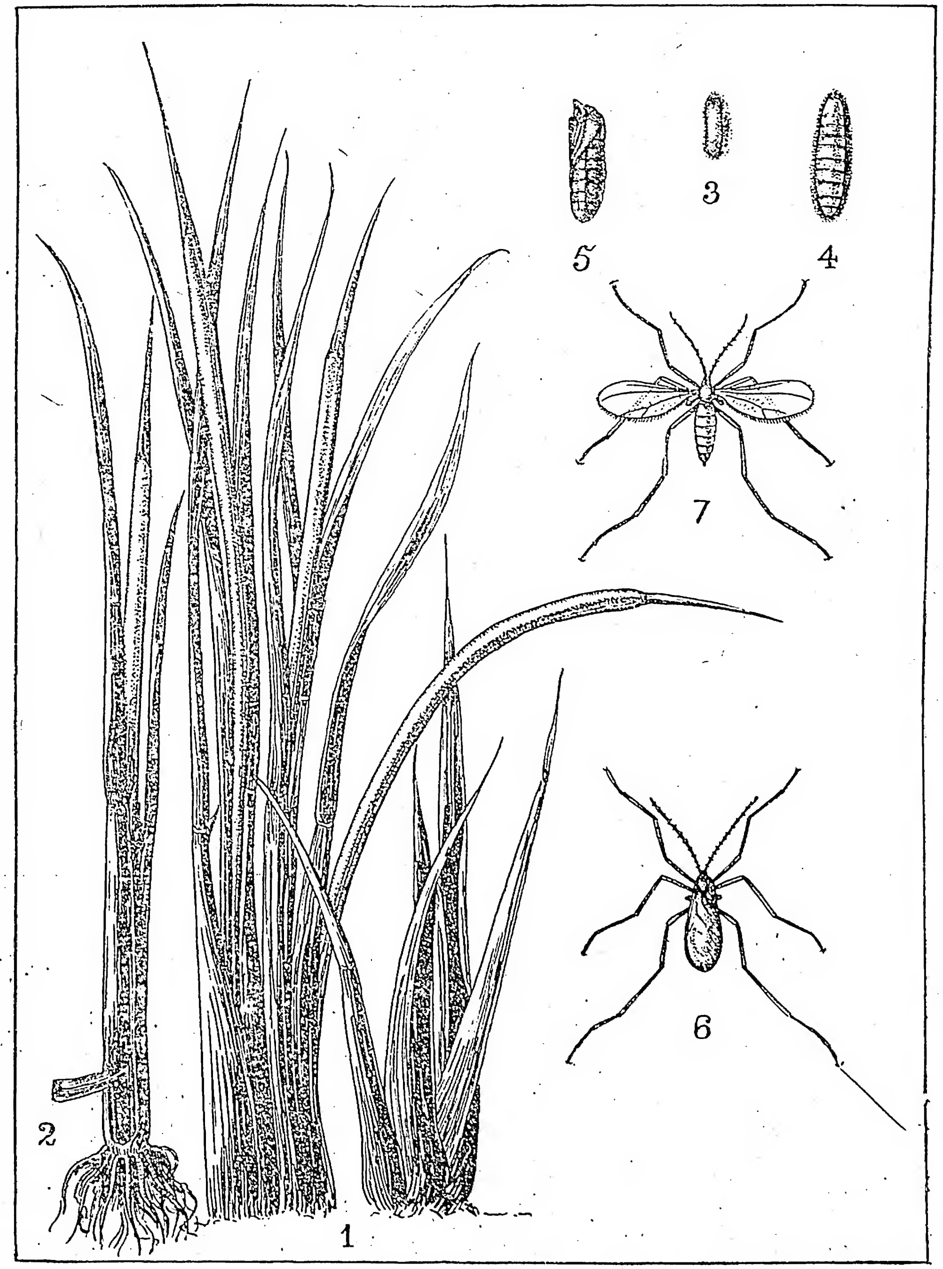
SCHAENOBIUS INCERTELLUS, Wlk.

1. Rice plant showing the moth resting (1a) and the egg mass (1b)
2. Portion of a damaged stem with the cocoon inside
3. Egg mass shown separately
4. Larva
5. Pupa
6. Male moth
7. Female moth



HIEROGLYPHUS BANIAN, F.

1. Rice plant with young hoppers feeding on leaves
2. Egg cluster with crust on it
3. Egg cluster with crust removed
4. Single egg magnified
5. Young grasshopper
6. Full grown grasshopper



PACHYDIPLOSIS ORYZAE, W.

1. Rice plants affected with the silver shoots
2. Affected plant with the pupa at its base
3. Egg enlarged
4. Full grown maggot
5. Pupa
6. Adult fly (sitting)
7. Adult fly (flying)

view to introducing and establishing them in their own countries for the biological control of this pest. These efforts have not been crowned with success so far. The following control measures are, however, recommended to reduce the damage caused by this pest as far as possible:

(*i*) All rice stubbles left in the field after harvest should be ploughed up, collected and burnt.

(*ii*) The bunds around the paddy fields should be kept free of wild grasses. If these wild grasses are allowed to grow the pest will breed in them in spring and summer and migrate to the paddy fields later.

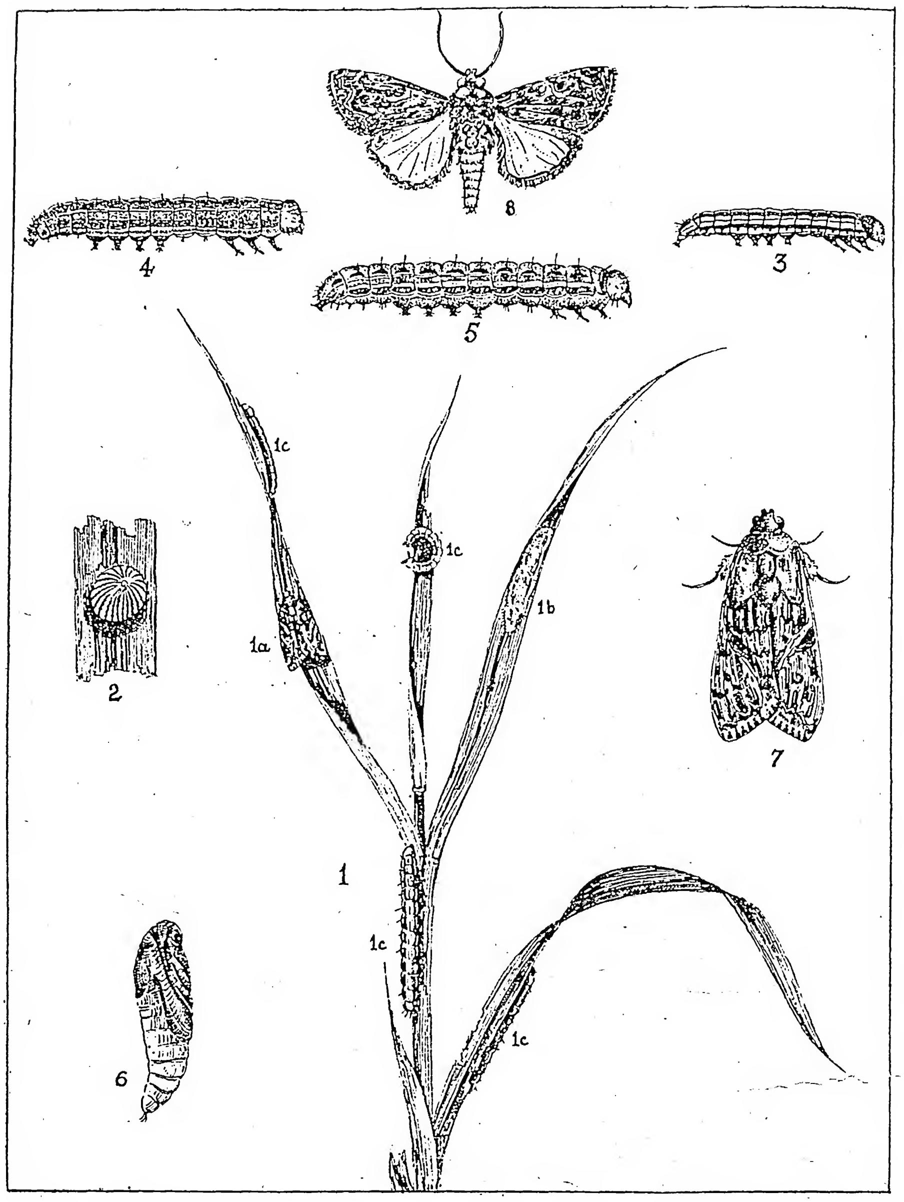
(*iii*) Light traps may be set up to trap the moths when the infestation is high.

(*iv*) In small holdings egg masses may be collected at weekly intervals and conserved in wire gauze cages from where the beneficial parasites that parasitize these egg masses can fly out through the meshes but not the newly hatched larvæ.

(*v*) Dusting with four to five per cent BHC at the rate of 12 to 15 lb. per acre may be carried out under expert supervision.

RICE SEEDLING BORER OR THE RICE SWARMING CATERPILLAR (Spodoptera Mauritia, BOISD.)

This is another borer pest of rice widely distributed in the Indian Union. Outside India it has been reported from Burma, Ceylon, Java, Malaya, Philippines and Hawaii. It is a serious pest of rice specially in the nursery. The caterpillars appear in big swarms in the seed beds and because of this gregarious habit they are popularly known as the 'swarming caterpillar' or also the 'army worm'. At times of severe infestation the seed beds appear as though they have been grazed by some cattle with practically no trace of seedling left in the bed. This may happen in the field also when the plants are young. The pest has also been met with on *jowar*, wheat, barley, cane and wild grasses but paddy is its favoured crop. The characteristic of this pest is that it appears suddenly in the field which renders its effective control a difficult proposition. The depredations of this pest are worst when they exhaust their wild-host plants and then *en masse* migrate to the *jowar* or paddy fields. The incidence of this pest is governed by weather conditions and, generally speaking, in such rice belts where the cold weather is suddenly followed by a spell of warmth, the incidence of this pest is very high. The moths are grey brown in colour and lay eggs in clusters on the lower surface of the paddy leaves. Each cluster contains from 100 to 400 eggs. The eggs are light yellow in colour and are covered with buff coloured hairs. These egg masses are conspicuous objects against the green background of the leaves. The eggs hatch out in about one week and the tiny caterpillars start feeding steadily on the plant. The larval stage lasts about three weeks. The full grown larva measures about an inch and a half in length. During the day time the caterpillars remain hidden under clods and crevices of the soil and at night they come out and feed on the leaves and stems of young plants causing severe damage to the young crop. The full fed larva pupates in the soil. The



SPODOPTERA MAURITIA, Boisd.
1. Rice plant showing the infestation by the pest in different stages 1a—the moth resting, 1b—egg mass, 1c—larva feeding on the leaf
2. Single egg magnified
3-5. Different stages of larva—half to full grown
6. Pupa 7. Moth 8. Moth with wings expanded

pupa is brown in colour. The moths emerge from the pupae in about ten days.

Control measures : The following control measures are recommended :

(*i*) When the caterpillars are in early stages the paddy seed beds may be flooded. Addition of kerosene oil at the rate of four pint bottles per acre to the flood water will add to the efficacy of the method.

(*ii*) The seed beds may be protected by surrounding them with narrow steep sided trenches.

(*iii*) In case of severe infestation dusting with five per cent BHC at the rate of 15 to 20 lb. per acre may be carried out under expert supervision.

PADDY CUT WORM (Cirphis Unipuncta, HAW.)

This is another of the major pests of rice which fortunately is only occasionally met with. The pest is widely distributed and has been reported from most of the rice growing tracts of the Indian Union. This species also like the 'swarming caterpillars' suddenly appears in the field in large numbers and is, therefore, known as the 'army worm'. The pest usually appears after heavy rains or early floods. The pest is rather serious in October and November. Fortunately the period of activity of the pest is very small. The moths are of light brown colour and lay eggs in batches usually in two adjacent rows. Hundreds of eggs sometimes numbering as high as 500 or 600 are thus laid. The eggs are round and greenish white in colour. The larvae are of dull green colour. The caterpillars hide during the day under clods and crevices of the soil and come out in the night to devour the crop wholesale. A full fed larva measures about one and a half inches long. The larva pupates under soil and eventually emerges as adult moth.

Control measures : The following control measures may be adopted on a field scale to reduce the damage to the minimum :

(*i*) Paddy fields infested by the pest should be ploughed up soon after harvest of the crop. This simple agricultural operation will bring about the destruction of a large number of pupae. Many will also be picked up by birds.

(*ii*) The caterpillars may be trapped by keeping heaps of grasses in the field during day time and then collected and destroyed.

(*iii*) Dusting with four per cent BHC at the rate of 15 to 20 lb. per acre may be carried out late in the evening. A large number of the caterpillars that are generally active in the night will thus be destroyed.

PADDY BUG OF THE Gundhi BUG (Leptocorisa Varicornis, FABR.)

This is a common and destructive pest of rice and is popularly known as the 'Gundhi bug'. It has been recorded from all the rice growing areas of the Indian Union. Sometimes it occurs in a severe epidemic form and covers millions of acres of rice fields. They suck the milky sap of the tender grain and bring about complete devastation of the crop bringing in its wake distress and famine over large areas. The pest has also been observed in *bajra*, maize, *marua*, wild grasses and even vegetables. The pest is slender in form and is dull green in colour which makes it rather inconspicuous against the green background of the rice leaves. It is active in the field during the cooler hours of the morning and the evening and takes shelter under shady places during the hot part of the day. The bugs have an offensive and penetrating odour and their presence in a paddy field can be detected from long distances. They attack the ripening grains and as a result of this feeding habit of the pest the ears wither away without maturing into grains. Even the cattle will not touch the straw of a seriously infested field because of its odour. Eggs are laid in a row on the leaves numbering from 5 to 20. Sometimes they are spread in two or three rows. The egg is oval in shape, flattened and a little depressed. They are generally laid at night and are firmly fixed to the leaf. The eggs hatch into tiny pale green nymphs in about six to eight days. The nymphal period lasts for about two weeks or a little longer and the complete life-cycle occupies from four to five weeks. The pest is injurious to rice during September and October in the northern rice belts while its incidence in the south is observed during the warm moist months of November and December. The pest hibernates in the adult form during the winter months and starts breeding in the warmth of spring if food is available. Five broods of the pest have been observed under normal climatic conditions.

Control measures : The following control measures may be adopted on a field scale :

(*i*) All bunds and other areas adjacent to rice fields should be kept as clean as possible.

(*ii*) When the infestation is high smoking and burning trash in the rice fields will result in a decrease in the population of the pest.

(*iii*) A light bamboo pole held at two ends by two farmers may be passed over gently over the plants. By a skilful manipulation of this method a very large number of nymphs will fall down in the water in the field and perish as the nymphs are very delicate and very susceptible.

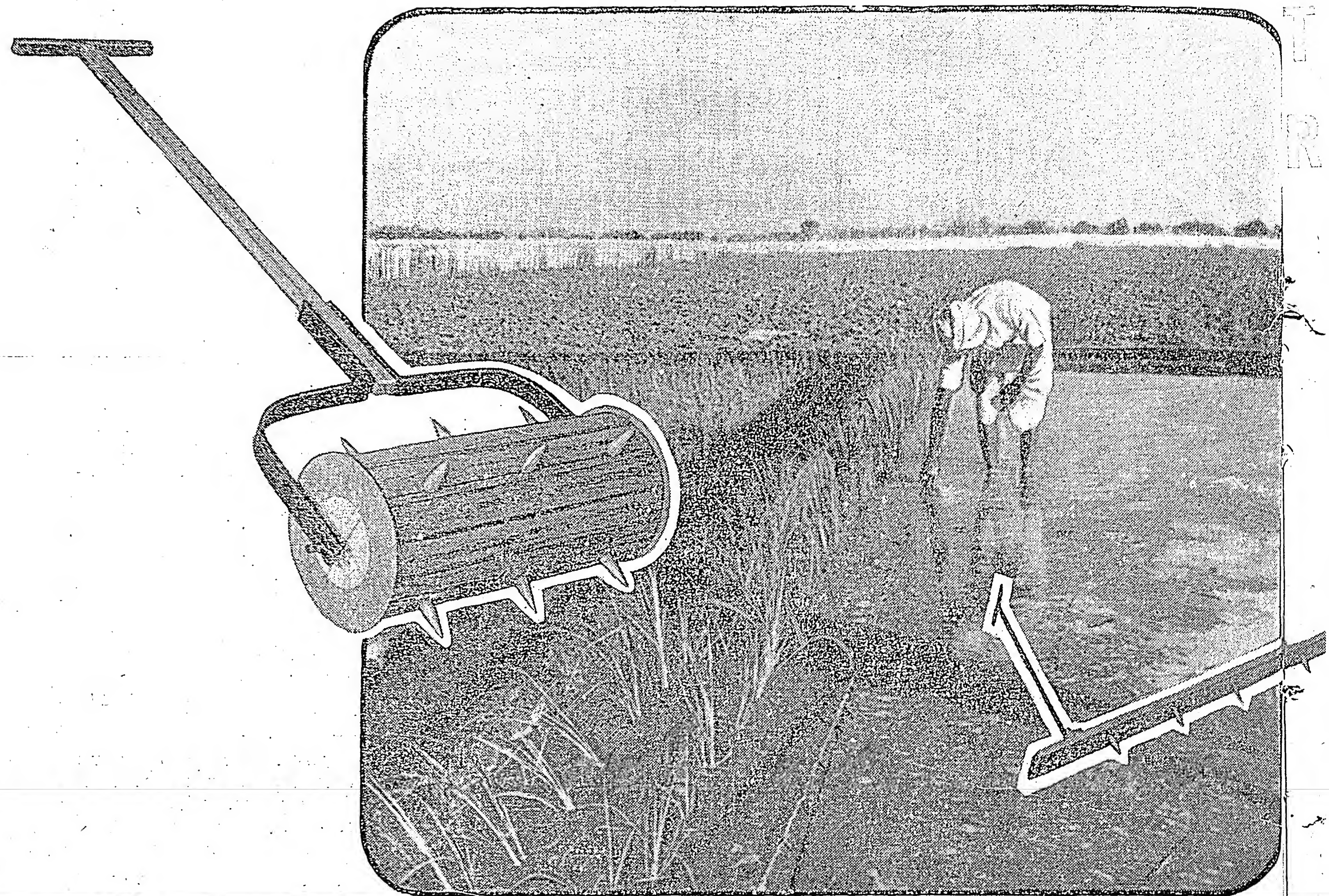
(*iv*) Dusting with five per cent BHC at about 12 to 15 lb. per acre may be carried out under expert supervision. In the early spring areas infested with wild grass in the vicinity of the paddy fields should be dusted.

RICE GRASS HOPPER (Hieroglyphus Banian, F.)

This grasshopper pest occurs throughout the plains of Indian Union where rice is grown. The pest also feeds on *jowār*, *bajra* and grasses and generally selects damp waste lands for its abode. Though it appears in the fields year after year, in certain years its incidence is very high and serious damage is caused to the crop. The nymphs as well as adults devour the soft paddy leaves and even the tender grains in the ears. Eggs are invariably laid under the soil on sides of bunds at a depth of about two to three inches below the surface. Eggs are laid in small cylindrically shaped tough pods. One female is capable of laying as many as 150 eggs in three to four pods. Each egg measures about 5 mm. long and 1 mm. broad and is yellowish in colour. The period of active oviposition lasts from October to December. The eggs remain under the soil till the next monsoon and start hatching as the rains come in June-July. The tiny hoppers

(*Contd. on page 31*)

HAND OPERATED



Transplanting rice by a thread-marker

By

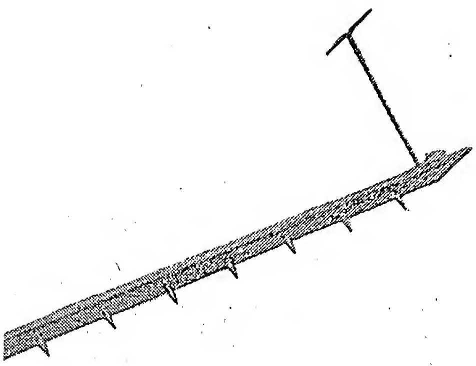
R. V. RAMIAH, Head of the Division of Agricultural Engineering, I.A.R.I., New Delhi

BESIDES assuring higher yields, the line-sowing of crops has an additional advantage over the broadcasting method in that it allows interculturing and weeding between rows which can be done both by hand implements as well as bullock-drawn weeders. This is particularly true in the case of the transplanted rice crop where hand weeders can be conveniently employed.

Manually operated weeders of the Japanese type which are now being manufactured in India are very convenient to use*. However, in order that these may be used rice seedlings should be transplanted nine inches or more apart. This requires marking of the field appropriately before transplanting. Marking by a thread with knots on it, or any other device of a similar kind, is a slow process and even then markings may not be as desired. To overcome this difficulty, use may be made of two markers of a simple type which are described below:

One of the markers consists simply of a wooden plank, about one inch thick and 12 ft. long, with wooden pegs fitted on one of its faces. The distance between

* *Indian Farming* October 1952, page 9



two consecutive pegs is usually nine inches, but this can be easily increased to 10, 11 or 12 inches or even more, according to requirements. There is an edge mark to ensure correct spacing of the rows. Two persons hold the plank on either side and press it with the pegs pointed downwards on the loose soil, thus obtaining markings of the regular intervals desired.

The other implement, a rotary type marker, is said to be in use in the rice fields of Japan and Korea. It is a hollow, wooden roller, on the periphery of which wooden pegs are fixed. When it is rolled on the ground, these wooden pegs leave impressions on the soil. The handle and framework of this marker can also be used for fixing the weeder-heads†. Such implements may be made by the farmers themselves.

Both the markers described above can be used on wet rice lands where the depth of standing water is about one inch. Some of these markers may find a place in experimental fields where the line-sowing of even dry crops is essential. The results of field trials of these implements are awaited.

† *Indian Farming October, 1952, page 9*

PLANT HORMONES

By
C. L. HAMNER and G. S. RAI,
Department of Horticulture,
Michigan State College,
East Lansing, Michigan

Growth modification by a plant hormone. One drop of 2, 4-D solution applied to the leaves

WITHIN the recent years man has made great strides in many spheres of endeavour. Such progress is not restricted to any particular field but is noticeable in all branches of science. It is only recently that growth regulating substances or plant hormones like 2, 4-D have found extensive use in modern agricultural practices. These developments may have far reaching consequences as far as the future of plant science is concerned.

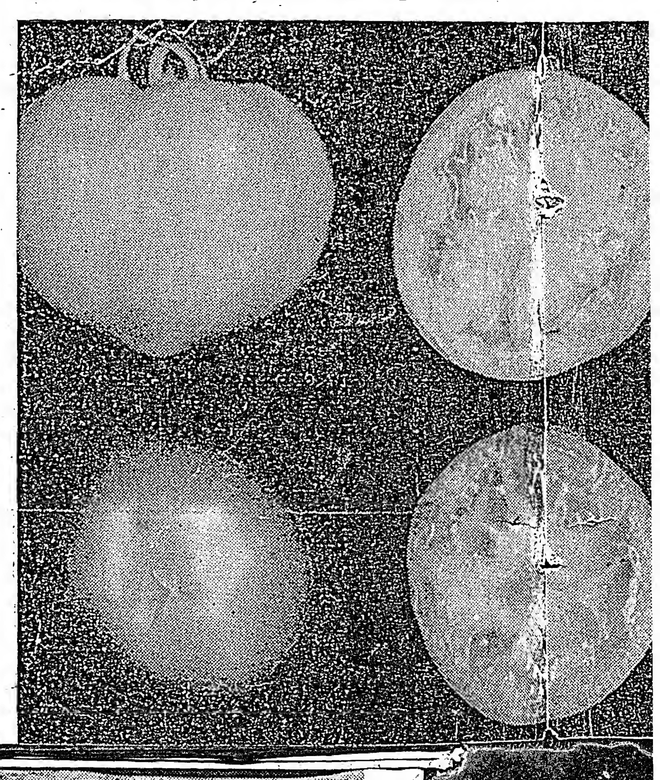
In the light of new scientific discoveries we are beginning to understand more clearly than ever before the growth behaviour of plants and the mechanism that is involved.

IMPORTANT ROLE

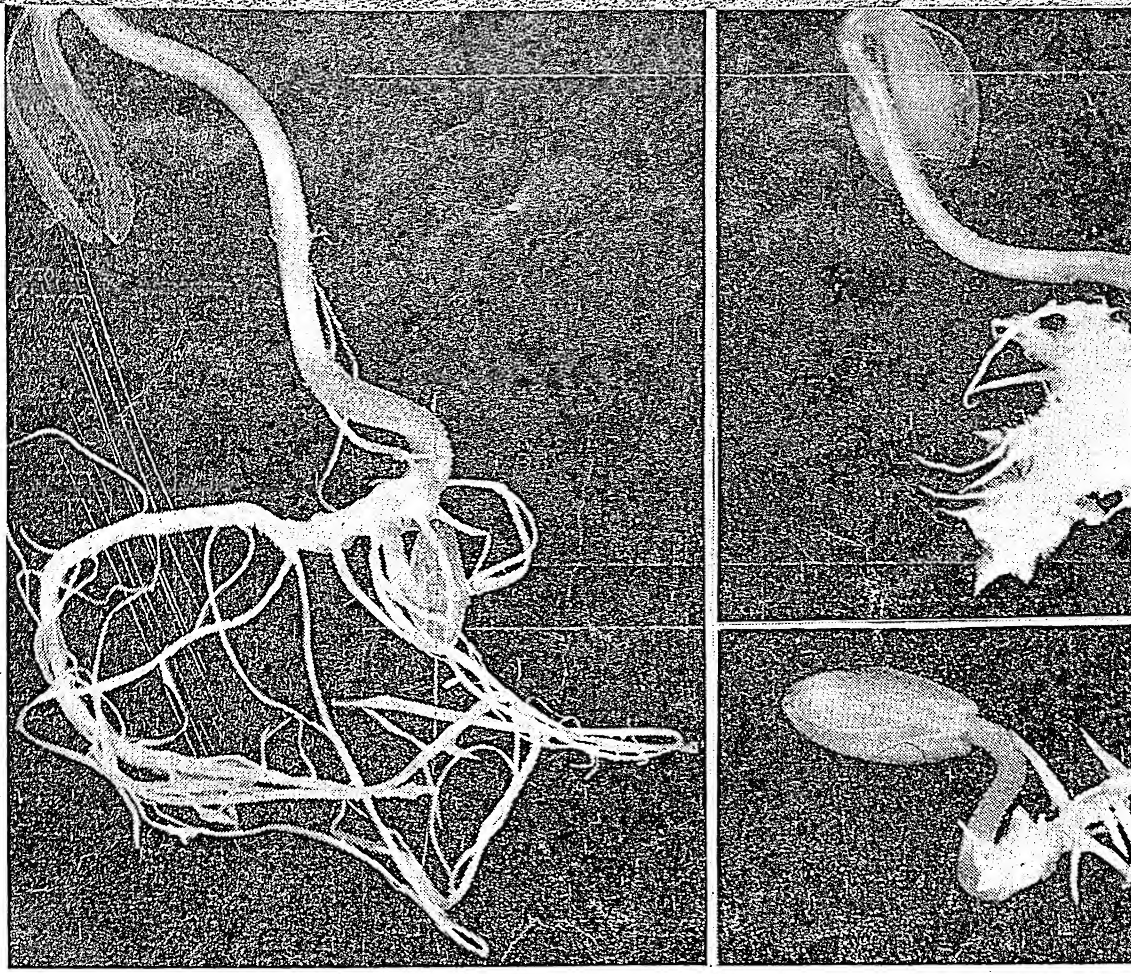
The all important role that hormones play in the life of plants may perhaps be better understood by citing an example of the complex and involved nature of the hormone response in animals. An animal, unlike a plant, has vision, a brain, a nervous system, a blood stream and hormone secreting glands, all of which act in coordination to produce an almost instantaneous reaction to the environment. For example, if a man sees a bear, the image is transmitted to the brain. The brain becomes alarmed and sends a message over the communication system (the nerves) to the adrenal glands which act in response to the message and secrete adrenaline, a hormone, into the blood stream. The adrenaline travels in the blood to the heart and stimulates it to a much greater activity. Thus in a matter of seconds the stimulated organ provides extra needed energy to surmount the crisis.

It is easier to understand the hormone mechanism of a plant as it is much more primitive, lacking the many complex systems of an animal. For instance, plant movements, a common occurrence in many plant species, is also, indeed, a function of hormone activity. Every one of us might have observed, at one time or another, the movement of a sunflower plant toward the source of light, the sun. Such a movement, which is the characteristic feature of the sunflower family, is due to the secretion of a growth promoting substance. This hormone secretion accumulates on the darkened side of a plant and causes it to grow more on that side. Thus the plant slowly moves or rather grows toward light. This physiological phenomenon, of hormone secretion, is the evidence of the natural provisions by which

Seedless tomato fruit from spray treatment with growth regulating substance



Root modifications induced by a growth regulator in cucumber seedlings



plants can adjust themselves to the environmental conditions.

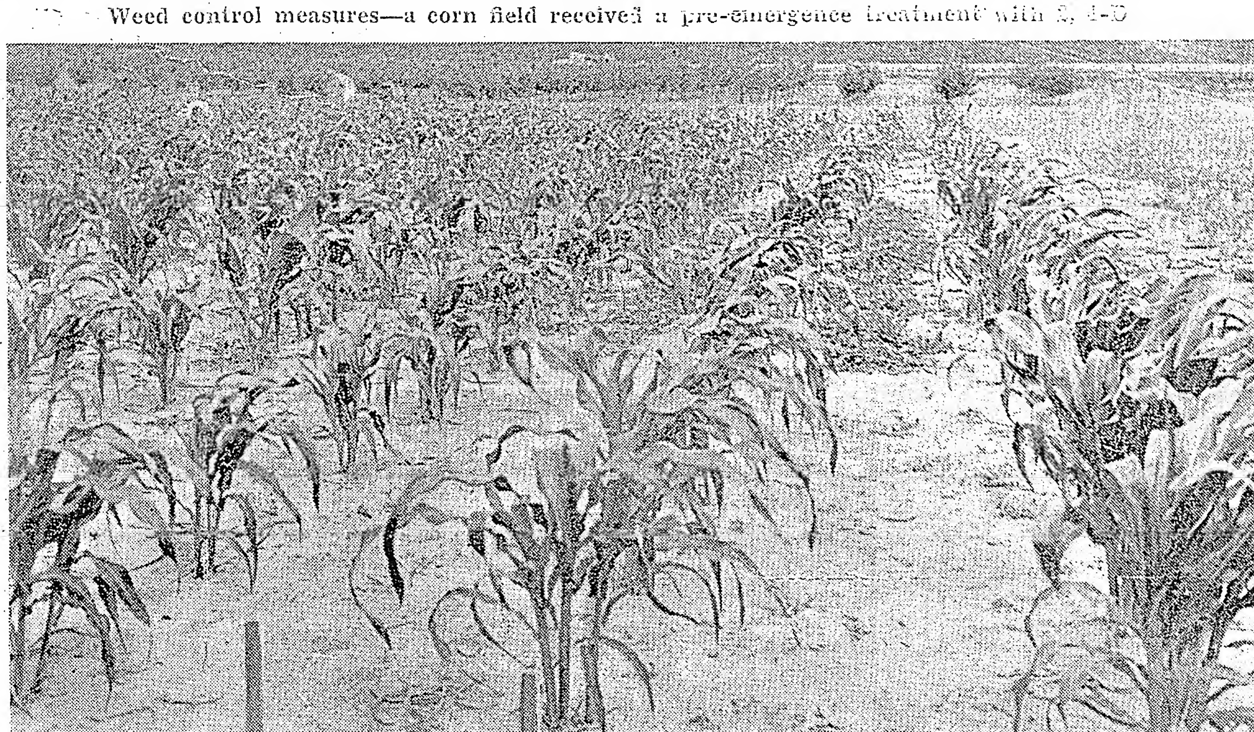
CHEMICAL AGENTS

These chemical agents travel throughout the plant to coordinate and regulate the various growth processes. Such growth responses as rooting, flowering, bulbing, fruiting, leaf fall, dormancy and disease resistance are controlled by these hormone secretions which are undoubtedly produced in a plant at various stages during its life span.

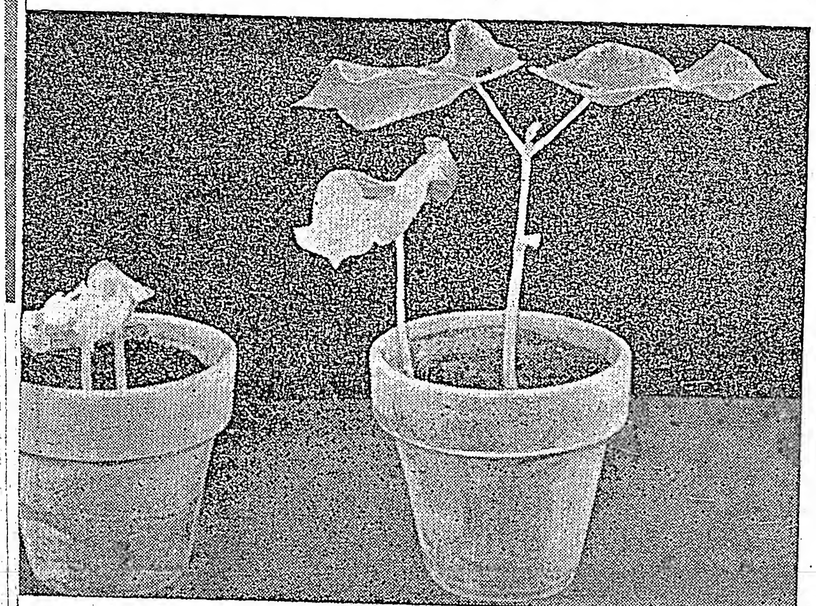
Some of these chemical agents that are controlling the growth processes have been identified by plant scientists. Indoleacetic acid, one of the growth promoting substances, has been produced synthetically by chemists in the laboratory and is now being sold by some of the chemical supply firms.

Modern agricultural practices, while embracing the old and efficient methods of crop production, have included the use of these compounds on a commercial scale. They are being used to control the growth of roots, to develop seedless fruits,

Weed control measures—a corn field received a pre-emergence treatment with 2, 4-D



Growth inhibition caused by growth hormone application to the soil. Plants on the right are raised in the treated soil



Bean seeds treated with chlorophyll inhibiting compound. Left—albino bean seedlings

Albino corn plants produced as a result of hormone spray treatments. Plants on the left are untreated

to increase fruit set, to thin fruits, to prevent preharvest drops of apples and pears. The scope of their application is being extended to regulate the growth processes, to hasten or to delay maturity, of a plant. Most important of all the inherent characteristics of these growth promoting substances have won them the most enviable position in the field of weed control.

BATTLE WITH WEEDS

Production of crops is a continuous battle with weeds. The estimated losses from weeds may run as high as $ 5,000,000,000 a year. From time immemorial the weed control phase of agriculture has been the basic problem of a farmer.

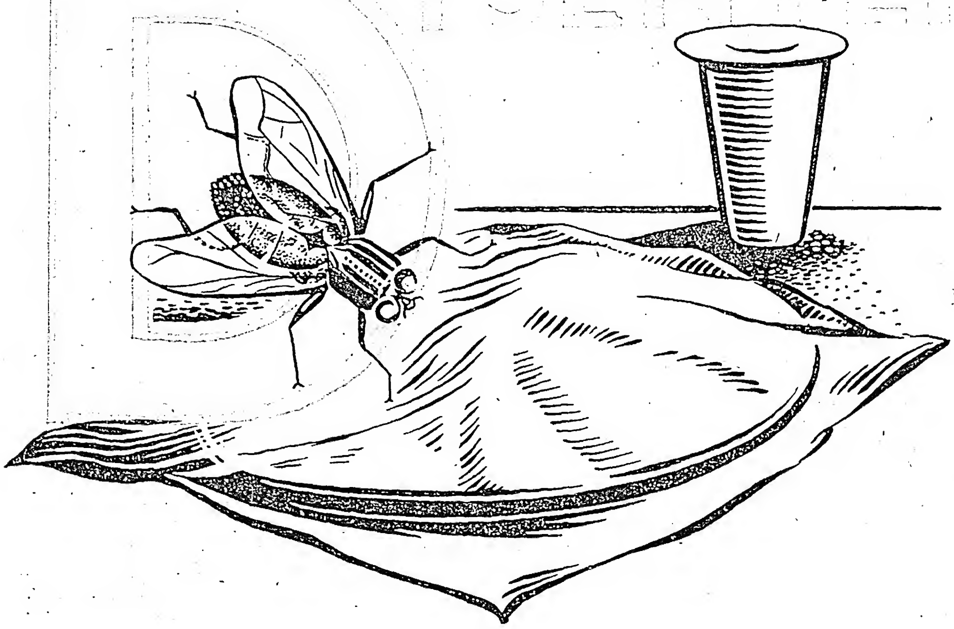
This consideration has demanded a serious attention from all those who are interested in the welfare of agricultural community or for that matter even the people engaged in gardening as a hobby have made their voices felt before the constant multiplication of weeds. As a result of these alarming losses and manpower shortage search for better and efficient means of combating weeds continued over a period of years. At last labours bore results with the development of a compound, 2, 4-D, which can be considered by far the most important herbicide thus far developed.

This chemical, 2, 4-D, when applied to most broadleaved plants, even in amounts as low as ¼ pound per acre, will upset the growth regulating mechanism of the plant, and thereby it serves a death blow to unwanted vegetation. However, it is selective in action, very active against most broadleaved plants and relatively ineffective against most of the monocots or grasses. Thus on account of its selective action against vegetation, it is employed, on a commercial scale, to control weeds in lawns, golf courses, and in the fields of wheat, corn, rice and sugarcane crops.

Realising the herbicidal value of this chemical, its application, in suitable concentrations, has come to be an accepted standard practice in the U. S. A. and Canada. The main feature, responsible for its popularity, is its easy translocation capacity within the plant thus affecting the root system as well as the tops. This property of the compound is very important in

(*Contd. on page 32*)

DYSENTERY*



Protect food from flies

THERE is hardly a person anywhere in our country who has not at some time or another suffered from dysentery. It is one of the commonest intestinal diseases. In some cases, the attack may pass off without much difficulty, while in others, it may prove to be a source of great distress and depression when it becomes chronic. However mild the attack may be, this is a kind of disease which should never be neglected or taken lightly, as it leaves dangerous complications in its wake.

Dysentery is characterised by the frequency of stools combined with mucous and blood, griping pain and tenderness in the abdomen. Some cases may be accompanied by fever.

The disease is caused by two different kinds of micro-organisms known as amœba and bacillus, and from the causative organism, these are known as amœbic dysentery and bacillary dysentery. Since the treatment for both these diseases is specific, it is important to differentiate the condition and treat accordingly to secure permanent and prompt cure. In any case of dysentery, only a doctor can arrive at a correct diagnosis, with additional investigation like examination of the stool specimens. But the attendant can certainly guess the type of dysentery if he pays intelligent attention to the characteristics.

Whatever the type of dysentery, the infection is carried by the mouth, reaching it through contaminated water, milk, vegetables and fuits and even eatables handled by an infected person. Flies are also responsible for the spread of the disease.

HOW INFECTION IS CARRIED

Water : The causative organisms are voided from the intestines in the stools and whenever water is contaminated with such stools, infection is carried to healthy individuals. Dysentery is more common soon after the first rains when inadvertently deposited faecal material washed out by rain water finds its way into the river and streams, tanks and ponds which act as source of infection to people using such water for purposes of drinking and cooking.

Vegetables and fruits : Again, in many places raw organic manure is used to fertilize the soil. Vegetables and fruits grown on such soil, unless thoroughly washed before use, are likely to harbour germs of diseases.

Milk : Milk is supplied in this country in open containers which are likely to be contaminated with causative organism. Some greedy milk vendors add water of doubtful purity to milk. The containers are often cleaned in dirty water from the ditches. These methods can be potent sources of infection. Raw milk is not safe for health. Milk should be pasteurized, or boiled as boiling kills disease germs.

Carriers : Foods handled by a person with the disease or by one who had been a victim of the disease in the past may get contaminated with germs that cling to finger tips and nail beds.

Flies : Flies are also responsible for the spread of these diseases as they sit with their hairy bodies on the human waste and then move over to feed on articles of food and deposit disease germs on them.

AMŒBIC DYSENTERY

This disease is caused by a tiny organism called amœba. It takes from three to twelve weeks to develop the symptoms of the disease after getting the infection in the body. It commences often with diarrhœa without fever. Afterwards bulky, foul-smelling stools containing mucous and blood are passed. There may be three to four or more motions daily. The onset of the disease is gradual and as the disease progresses, there is loss of appetite, indigestion and anaemia. The tongue remains coated but there are no signs of toxaemia. There is a localized tenderness in the abdomen particularly in the region of large intestines (Colon). There is certain amount of griping and tenesmus in the abdomen. The greatest danger of this apparently simple disease

* *Contributed by the Health Education Section, Ministry of Health, Government of India*

is that it tends to be chronic and carriers are frequently met with.

Once the correct diagnosis is made, specific treatment can be had from a competent doctor. It should be noted, however, that mere relief from symptoms does not mean a cure. Some treatments when started show spectacular relief and many a time, the treatment is not completed, which, in course of time, results in a chronic condition and sometimes dangerous complications like liver abscess. Every case of amœbic dysentery however mild, should be correctly diagnosed by a doctor and fully treated. Many persons become carriers of the disease even when apparently cured.

BACILLARY DYSENTERY

This condition is caused by a variety of bacteria and the severity and course of the disease depend on the type of causative organisms. Basically, bacillary dysentery is more common in young children. The onset is sudden and the incubation period is not longer than a week. It is usually accompanied by fever and frequency of stools. The stools are numerous and usually consist of mucous and blood and very little or no fæcal matter and have no foul odour. There is generalised tenderness over the abdomen and severe griping and tenesmus. The tongue is clean but patients show signs of toxæmia.

With the modern treatment with sulpha and other drugs rapid and complete cure is possible. This disease usually does not become chronic but re-infection is possible.

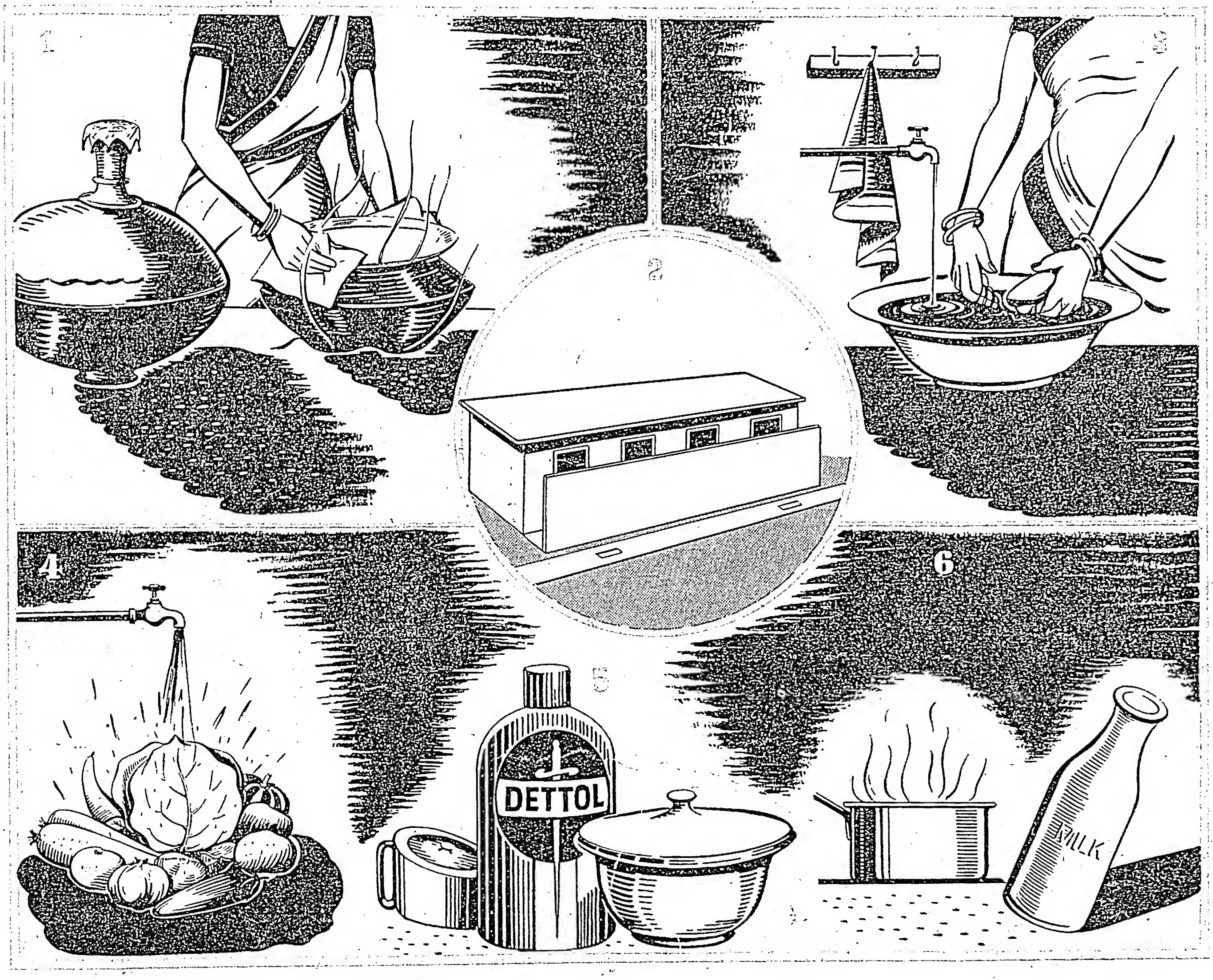
Before starting any treatment, correct diagnosis by a doctor is essential. General signs and symptoms do give indication as to the kind of infection but need confirmation.

PREVENTION

Prevention of dysentery whether caused by amœbæ or bacilli consists in seeing that no food or drinks are

(*Contd. on page 23*)

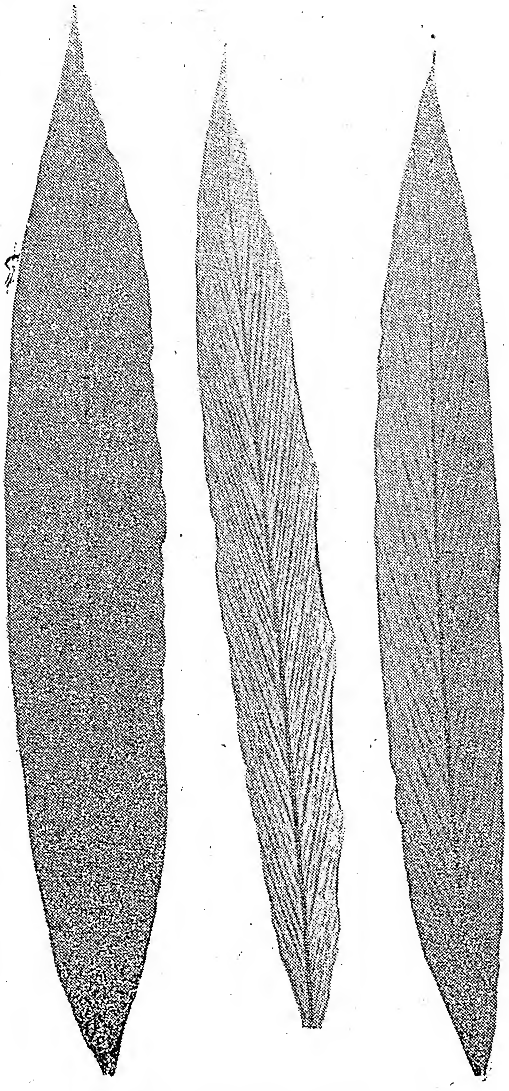
1. Drink boiled water 2. Sanitary latrines should be constructed 3. Wash your hands with soap and water after toilet and before handling food 4. Fruits and vegetables should be washed before use 5. Sanitary disposal of patient's excretal material is essential. 6. Take milk only after boiling



'MARBLE' DISEASE OF CARDAMOM

By

P. M. VARMA and S. P. CAPOOR,
Division of Mycology and Plant Pathology,
Indian Agricultural Research Institute, New Delhi



Healthy (extreme left) and diseased leaves

CARDAMOM (*Elettaria cardamomum* Maton) is one of the most important spices and an article of daily use in Indian homes. It is mainly grown in South India, along the Western Ghats, at an elevation of 2000 to 4000 ft. The total area under cardamom exceeds 100,000 acres. During 1938-39 when the price of cardamom was one half of what it is today, India exported 13,202 cwts. of cardamom costing Rs. 31,51,091.

'Marble' or mosaic locally known as *katte* (death) is the most destructive disease affecting cardamom. The popular notion among the cultivators in North Kanara is that the disease is soil borne and infects plants when they are about three years old.

SYMPTOMS

The disease is characterised by the appearance of almost parallel pale green discontinuous streaks running from the midrib to the margin of the leaf. Diseased plants, however, look pale from a distance and can

A four-year old plant after one year of infection

A three-year old healthy plant

be easily distinguished from healthy ones.

A young cardamom plant after infection becomes a total loss as it fails to yield. In older plants the immediate effect of the disease is the reduction in fruiting shoots and tillering so that within a year or so the plants become useless as the rhizomes gradually shrivel up and die. The diseased plants if allowed to remain in the plantations act as reservoirs of the disease and source of infection to healthy plants.

DISSEMINATION OF THE DISEASE

The 'Marble' disease of cardamom is caused by a virus which cannot pass from one plant to another through touch or by other mechanical means. It is disseminated in nature by a species of black aphid popularly known as 'Banana aphid' (*Pentalonia nigronervosa* Coq.). Though banana is the main host of the aphid it also breeds on cardamom during winter months. Even a single aphid after feeding on diseased cardamom plant is capable of infecting other healthy plants. In areas where cardamom is propagated vegetatively, the disease is easily disseminated through diseased rhizomes. The virus is not known to affect banana or any other plant except cardamom.

CONTROL

The disease has been successfully controlled since 1947 over an area of 160 acres at Sirsi (North Kanara) by adopting the following control measures :

(*a*) Complete eradication of all cardamom plants in November, 1947. (In all, 10,000 cardamom bushes of all ages were cut down and burnt) ;

(*b*) Transplanting of the cleaned area with seedlings raised from seed under disease-free conditions from November, 1948 onwards.

The importation of any cardamom seedlings from outside into the controlled area was completely stopped and in March, 1953 the position was as below :

Total number of cardamom bushes

One to three years old	12,000	i.e., 19,000
Four to six years old	7,000	

Number of cardamom plants diseased from 1947 to 1953 and rogued 65, i.e. 0.03 per cent

During the last three years these operations have been gradually extended to cover 750 acres in 19 different villages in Sirsi Taluka. There are nearly 36,000 bushes in this area and some of these are five to eight years old. In localities where the cultivators are cooperating in roguing out the diseased plants the disease has been completely controlled.

In the light of the experience gained from the work in North Kanara in Bombay, it is safe to conclude that this serious disease can be effectively controlled by adopting the following measures :

(1) Total eradication of all old and diseased cardamom plants,

(2) constant and ruthless roguing out of diseased plants at regular intervals, and

(3) transplanting of healthy seedlings which have been raised under disease-free conditions.

The work can only yield results if all the cultivators in a particular locality carry out these operations simultaneously. Even a single diseased plant left over is sufficient to start a fresh infection.

DYSENTERY

(*Contd. from page 21*)

contaminated with bowel discharges. The points to remember in this connection are :

(*i*) Sanitary disposal of human fæces by constructing sanitary latrines as advised by the Health Department.

(*ii*) Disinfection and sanitary disposal of patient's excretal material.

(*iii*) Washing the hands with soap and water after toilet and before handling food.

(*iv*) Eating fruits and vegetables only after washing them thoroughly.

(*v*) Boiling the milk before use.

(*vi*) Boiling drinking water and ensuring purity of water supply.

(*vii*) Protecting food from flies.

A fine crop of sweet potato (variety F.A. 17) in the fields of farmer Budh Ram of Gheora Village, Delhi State

By
H. B. SINGH,
Division of Botany, Indian Agricultural Research Institute, New Delhi

IN India, the sweet potato as a food and industrial crop, has not received the attention it deserves. Though appreciable quantities of sweet potato are consumed, particularly in some of the eastern States like Bihar, this crop has yet to find its rightful place amongst the regular food crops in our country.

Sweet potato is a multipurpose crop. As a source of human food, its merits have been well recognised in other countries. Sweet potato flour is a good substitute for corn flour, wheat flour or rice starch in the preparation of milk jelly (*firni*), puddings, cakes and biscuits. A mixture of one part of sweet potato flour and four parts of wheat flour has been reported to work well for making *chapatis*. According to the nutritionists of the United States Bureau of Human Nutrition, one medium-sized sweet potato, an average serving for most persons, provides at least one third of the total requirement of Vitamin C needed in a day. Some of the yellow-fleshed varieties are also a rich source of carotene. In the United States, preparations like Alayam candy, Alayam snacks and Alayam breakfast food—all sweet potato products, are becoming more and more popular.

On the industrial side also, the sweet potato has several uses. It is used in the manufacture of industrial alcohol, syrup and starch for textiles. Being a useful source of starch, this tuber crop can partly relieve the pressure on foodgrains which are now-a-days used for starch manufacture. Varieties specially evolved for the starch industry are now available in several sweet potato growing countries.

For the cultivator who grows the crop for the sake of tubers, the green shoots provide good fodder for his cattle which compares favourably with other green feeds, in proteins, fats, carbohydrates and mineral matter. And above all, it can be grown easily at a low cost of production, and gives a very good out-turn.

There is, therefore, every reason to think that there is scope for extending the cultivation of sweet potato. Whether or not this tuber crop gains further popularity, the fact remains that we do grow nearly 2,50,000 acres, in the various States of India. A substantial increase in the total production from this area can, therefore, be expected if cultivation of varieties which are now known to give much higher yields than the local varieties, is taken up.

THE CHINESE VARIETY COMES TO STAY

In the September, 1951, issue of *Indian Farming*, a short account of the potentialities of two Chinese varieties of sweet potato viz. F.A. 17 White and Tie Shin Tun, was published for the information of the

Statistically laid out varietal trials at the Government Agricultural Farm, Jullundur (East Punjab) have proved the superiority of F.A. 17 White

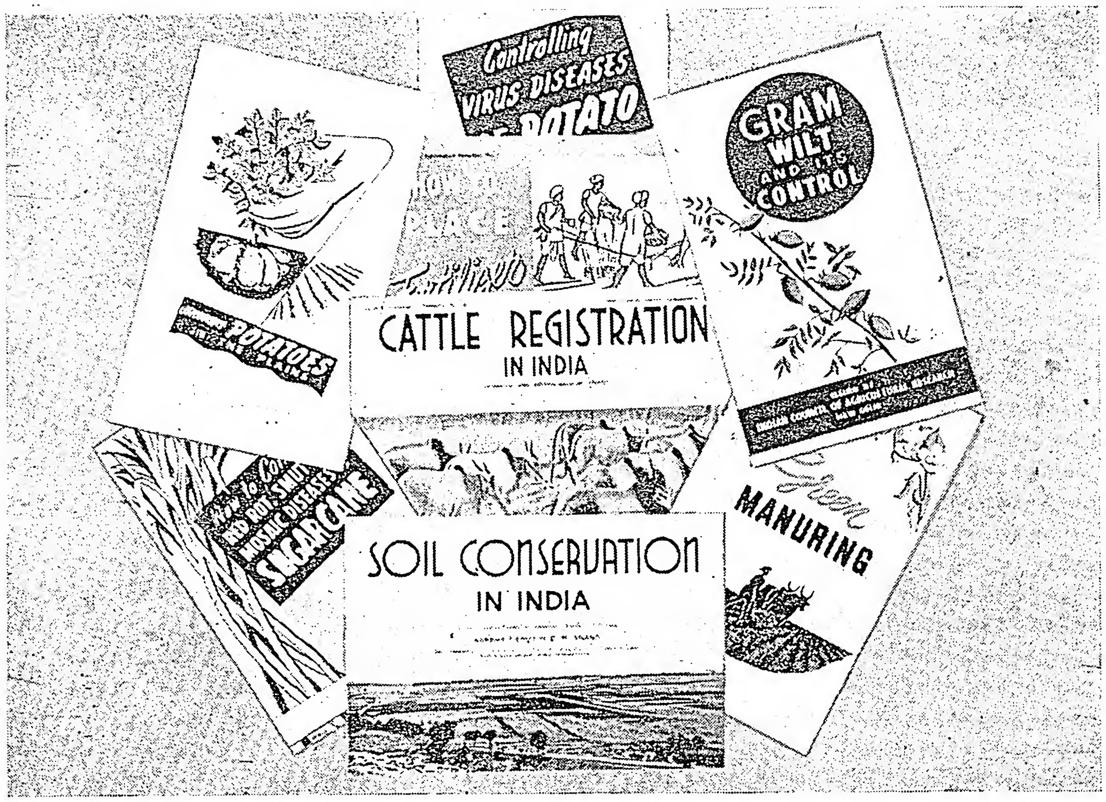
farmers. Encouraged by the results of the initial trials, arrangements were made for more extensive trials, particularly of the variety F. A. 17 White, over a wide range of soil and climatic conditions. Indications are that this Chinese variety has definitely come to stay.

In the Delhi State, vine cuttings were distributed in some of the villages where the Intensive Cultivation Scheme of the Indian Agricultural Research Institute is operating, i.e. the Indarparastha Estate and Mandauli Fazilpur in the Shahdera area. Yields ranging from 125 to 255 maunds per acre have been reported from these places. These yields would seem quite significant when it is realized that very little attention is usually bestowed on this crop. The local varieties seldom reach a three figure yield when grown under similar conditions.

In the Punjab trials, carried out mostly at Jullundur, under the Tuber Research Scheme, this variety has given consistently high yields over a period of three years. The Punjab Department of Agriculture is taking steps to popularize this variety.

In the Ganga-Khadar tract in the Etah district of Uttar Pradesh, the sweet potato is fairly commonly cultivated crop. Truckloads of sweet potatoes are sent for marketing to Delhi especially from the Kashganj and Soron markets. Trials carried out at the Neoli and Udher Farms of the Neoli Sugar Factory (Etah district) have shown that F. A. 17 is superior to local Red and White varieties. At Udher Farm it yielded 25 per cent

(*Continued on page 27*)



The object of the information series of pamphlets and leaflets which are being issued by the I. C. A. R. is to make available the latest results of research to the educated farmer and the village level worker in a practical form.

These pamphlets and leaflets are written in the simplest possible language and contain practical recommendations which can be adopted by progressive farmers in carrying out their day to day tasks.

The following pamphlets and leaflets have now been issued :

			As.
1.	Soil Conservation in India	(English)	8
2.	Cattle Registration in India	(English)	8
3.	Green Manuring	(English)	8
4.	Growing Potatoes in the Plains	(English)	8
5.	Agricultural Implements for Indian Farmers	(English)	8
6.	How to control Red Rot, Smut and Mosaic Diseases of Sugarcane	(English)	6
7.	Organic Manures	(English)	6
8.	Growing Vegetables in Delhi State	(English)	4
9.	Dry Farming in the Deccan	(English)	4
10.	How to Place Fertilizer	(English)	4
11.	How to Place Fertilizer	(Hindi)	2
12.	Growing Potatoes in the Plains	(Hindi)	2
13.	How to control Red Rot, Smut and Mosaic Diseases of Sugarcane	(Hindi)	2
14.	Controlling Virus Diseases of Potato	(English)	2
15.	Controlling Virus Diseases of Potato	(Hindi)	1
16.	Gram Wilt and its control	(English)	2
17.	Gram Wilt and its control	(Hindi)	1
18.	Controlling Common Pests of Paddy	(English)	4
19.	How to control Root, Top and Stem Borers of Sugarcane	(English)	2
20.	Cheap Manure	(Hindi)	1
21.	Kill the Fly	(English)	1
22.	Japanese Method of Paddy Cultivation	(English Circular)	Free
23.	Japanese Method of Paddy Cultivation	(Hindi Circular)	Free
24.	Japanese Method of Paddy Cultivation	(English Flip Book)	Free
25.	Japanese Method of Paddy Cultivation	(Hindi Flip Book)	Free
26.	Japanese Method of Paddy Cultivation	(Seed Treatment, English Edition)	Free
27.	Save Wheat from Tandu Disease	(Hindi Strip)	Free
28.	Farmer Lal and his Wheat	(Hindi Strip)	Free

Remittances of the cost of the pamphlets required together with postal charges should be sent in advance to:

SECRETARY, INDIAN COUNCIL OF AGRICULTURAL RESEARCH, NEW DELHI

by money order in order to ensure prompt despatch.

GROW MORE SWEET POTATOES

(*Contd. from page 25*)

and 100 per cent more than the local White and Red, respectively. These trials will be repeated in the next season. At the Botanical substation at Pusa (North Bihar) of the Indian Agricultural Research Institute, F. A. 17 has given 30 and 55 per cent more yields than the local varieties Alpan and Talentia, respectively.

This has happened not only in the north but in the south as well. Until recently, it was considered that this variety may be expected to do well in the northern parts only as the climatic conditions in the south were markedly different. Recent trials carried out at the Hebbal Farm, Bangalore (under the Tuber Research Scheme of the Indian Council of Agricultural Research) have, however, proved to the contrary. This variety has out-yielded all exotic and indigenous collections tried at this station, and has given 50 per cent more yield than Husur—the next best local variety. These results show that the Chinese variety F.A. 17 White has a wide adaptability.

It is interesting that F.A. 17 White combines high yielding capacity with qualities of a good table variety. Its cooked flesh is moist, less fibrous and far above average in sweetness. The following results of analyses of tubers of F.A. 17 White and Talentia—a Bihar variety, which proved to be the best in yield amongst the indigenous varieties, clearly indicate the superior quality of F. A. 17 White as a table variety. The analyses were carried out in the Division of Chemistry at the Indian Agricultural Research Institute.

	Crude protein (p. c.)	Crude fat (p. c.)	Crude fibre (p. c.)	Moisture (p. c.)	Total Sugar as sucrose (p. c.)	Starch (p. c.)
F. A. 17 White	0.86	0.66	1.18	71.2	5.01	19.3
Talentia	0.72	0.67	1.20	71.0	3.24	20.7

COLOUR PREJUDICE

The tubers of the sweet potato varieties commonly cultivated in India are either white or red-skinned. Some varieties also have brownish colour. In the northern parts, red varieties are preferred to white varieties, whereas in the south opposite is the case. This colour preference seems to be just a traditional belief without any real basis. Tubers of various skin colours have been analysed at the Indian Agricultural Research Institute. There are no indications of any association between skin colour and sweetness or any other quality of the tuber that go to make a good table variety. Therefore, there seems to be no valid reason for any prejudice against the white skin of tuber of F.A. 17 White.

PLANTING MATERIAL.

The planting material of this variety is being propagated in the Division of Botany at the Indian Agricultural Research Institute, New Delhi, and at its Botanical Substation at Pusa (North Bihar), at the Government Agricultural Farm Jullundur (Punjab) and at the Farms of the Neoli Sugar Factory (Etah district, Uttar Pradesh). These sources may be referred to for the supply of planting material.

GREAT POTENTIALITIES OF *Sesbania Speciosa*

By

R. M. SAVUR

IF I mention anything about the elementary principles underlying certain agronomical practices it is because of the many readers of this magazine who are uninitiated but practical farmers, without having had the advantage of being in an agricultural college or school. I have one other advantage which other farmers do not have and that is extreme infertility of my soil which is barren, sand washed cleanly by a hundred monsoons during the years it has been lying uncultivated and uninhabited. More has been learnt by a study of the defective than by the study of the normal.

The vital lesson I have learnt is that soil fertility must be the basis of any permanent system of agriculture. As Mr. Albert Howard says, "The key to a fertile soil and a prosperous agriculture is humus." The best definition of soil fertility I have come across is that given by Mr. Albert Howard in his book *An Agricultural Testament*: "It is the condition of a soil rich in humus in which the growth processes proceed rapidly, smoothly and efficiently. The term, therefore, connotes such things as abundance, high quality and resistance to disease".

HUMUS AS MEDIUM FOR PLANT GROWTH

Waksman enumerates eight or more qualities of humus which make it such an essential and excellent medium for plant growth. In addition, it has one property which is essential for cultivators of soils like clays or sands. It is that humus alone can provide that cementing substance essential for creating and maintaining the compound soil particles so important in the maintenance of soil tilth, a physical condition of the soil without which there can never be optimum plant growth. The source of humus is organic matter in the soil. Humus has never been produced in the laboratory and has so far defied both the synthetic as well as the analytical chemist.

Since organic matter is the sole raw material for the production of humus either by decay in the soil or by composting, large volumes of green leaves are essential if every cultivated acre is to produce the maximum it is capable of. The farmer must grow his own green manure or go without and see his lands losing fertility every day. From time immemorial green manuring has been the traditional practice and so our cultivators are fully aware of the value of green manuring in some form. The trouble, however, is that most of them either do not know how to grow their own green manure or do not have the facilities to do so. The farmers' difficulties should be appreciated and ways to circumvent them must be found before we can expect any large spread of the practice of growing one's own green manure.

GROWING A GREEN MANURE CROP

In this country the long dry season following a short season of rainfall is one difficulty. Owing to this one has to grow the green manure crop during the very part of the year when other crops must be grown. Few can afford or would care to sacrifice a cash crop for growing a green manure crop unless it can be used for manuring a crop that can follow it in the same season. Where this can be done the ryot can usually grow two cash crops and would prefer to do the latter. So if one is to grow a green manure crop one should possess some dry or waste land for growing it, and to use the green manure so grown, he must have land capable of growing a second crop or he should compost the organic matter and store it till the next wet season. In most deltaic areas there is no dry or waste land for a green manure crop. In certain parts of West Godavari throughout the paddy season there is not even standing room for the cattle which have to be driven to the hills miles away until the canal irrigation is stopped and all the crops are harvested. Even in the case of a farmer who has spare land in which to grow a green manure crop, there are aspects of the problem which are overlooked. He is merely transferring the fertility of the spare land to his cultivated fields. If he is to grow a green manure crop on this spare land he can also grow a cash crop and he would prefer to do it unless he can be convinced by economic data derived from careful experiment that it will pay him more to use this spare land to grow green manure than a cash crop.

Considering the place of rice in our dietary, we have necessarily to place the paddy crop above all others. The paddy plant, in addition, requires peculiar conditions for proper growth: it is so delicate that any defect in any of these conditions immediately results in serious decrease in yields. The innumerable and most carefully conducted manurial experiments made at our paddy research stations over a long period of years have shown that green leaves are required for good growth of the paddy plant. I seem to recollect reading that green leaves have given better results than cattle manure alone. Why this should be so I have not been able to gather. Probably decaying green leaf is more suitable than the decomposition products of cow dung, for growth of algae which, I read somewhere, provides the oxygen necessary for the paddy plant growing under swamp conditions. However, the undisputed fact is that green manure is necessary for paddy. It will be specially advantageous if anyone can show how the small paddy cultivators who have nothing but the wet fields they cultivate and who produce most of the rice grown in this

country, can grow green manure crops without sacrificing any paddy crop.

In Madras, *Sesbania speciosa* has been recommended to be grown in the paddy fields along with paddy for ensuring the supply of green manure. I believe that this way of growing *Sesbania speciosa* will improve our paddy yields.

MY OWN EXPERIENCE

My experience with this legume is worth mentioning. I was myself in search of a legume which would grow in water, because most legumes have excessive moisture. Some years ago when I visited the Kankanady Paddy Breeding Station, I was told of *Sesbania speciosa* and a suggestion was made that I should try it. I took a few seeds and sowed them in my rain fed dry area but the plants made very poor growth. When I mentioned this at my next visit to the Station, I was informed, it grows well in water and I was advised to transplant a few plants in my water-logged areas. I did this but even with a copious supply of flowing water, the plants did not grow more than a foot or 18 inches in height. I gave up *Sesbania speciosa* especially as there seemed to be considerable doubt whether it had any fodder value. I prefer forage legumes.

In a few years after my first trial I noted how exceedingly well *Sesbania speciosa* was doing at the Kankanady Paddy Breeding Station, where its capabilities were being fully and efficiently exploited to meet the green manure requirements. This time I tried it in some fields where I had grown cowpea for three successive years. I was amazed at its magnificent growth for within four months the plants had grown into little trees 10 to 15 feet tall in spite of the fact that I had topped them when they were about four feet in height.

FACTS ABOUT Sesbania Speciosa

I have learnt from my trials the following facts about *Sesbania speciosa :*

(1) My failure with it was due to the reason that I sowed the seed in a new and very infertile area where no legumes had ever been grown. My recent success is due to the reasons that these later sowings were in areas in which soil was well innoculated with nodule bacteria, and in which it was brought up to a fairly high level of fertility by three years of intensive cultivation.

(2) Sowings in new areas were successful when even small doses of farmyard manure were used to ensure innoculation and provide enough nutrients for the seedlings to make good growth until adequate nodule development took place. The suggestions that I wish to make are as follows :

(1) I have known more than one 'demonstration' fail. When the seed is to be sown in land in which any legume has never been grown only innoculated seeds or well nodulated seedlings should be distributed.

(2) The Department should make some attempt to grade varieties and species according to fertility levels required by each and make the information available to the farmers.

(3) With the increased attention that is being paid to cattle improvement and the growing of fodder and forage crops, more emphasis should be placed on green manure species that livestock will eat. The menace of straying cattle can be effectively controlled if the example of other countries is followed where it is a penal offence if a man fails to fence against his own cattle straying.

 (Contd. from page 13)

that measure about a quarter of an inch in length start feeding on grasses on the bunds till September and October and then mirgrate to the rice fields. The rate of feeding naturally increases as the young hoppers grow and so the loss to the crop is great when these descend in the rice fields in large numbers. The nymphal period lasts from two to three months in the case of males and two and a half to three months in the case of females. Eggs are generally laid when the adults are about two weeks old. The pest has only one generation a year. Its habit of laying eggs in the bunds and its early feeding habit render the control operations not very difficult. Its short range of flight often-times not exceeding 20 to 30 feet enables us to make the control operations quite effective.

Control measures: The climatic complex of temperature, humidity and rainfall vitally govern the population and the activities of the pest in the field. Excessive rains or rains followed by intermittent periods of drought are detrimental for the pest. The following control measures can be applied with great advantage for the destruction of the pest.

(*i*) Deep ploughing of the field specially of the gentle slopes of the bunds will result in the destruction of a large number of egg masses.

(*ii*) Poisoned baiting of the young hoppers with the following formulation will be effective:

Bran	80-100 lb.
Sodium flousilicate	2 lb.
Molasses	2 ,,
Water	add as required

(*iii*) Dusting of the hoppers with 5 per cent ~~HBC~~ BHC at the rate of 10 to 20 lb. per acre according to the degree of infestation will give good results. The operation should be concentrated more in the early stages when the hoppers feed on grasses on the bunds. Dusting on rice should, however, be done with caution and under expert supervision.

RICE HISPA (Hispa Armigera OL.)

The rice hispa occurs chiefly in the southern and the eastern regions in the Indian Union and at times causes serious damage to the crop. It has been recorded in Assam, Bengal, Madras and Orissa. The pest is less commonly met with in the other rice growing tracts of our country. It is a small blue black beetle covered with spines. In case of severe infestation the plants may wither away. The beetle lays eggs singly on the leaf near the tip. The eggs hatch in about four to five days and the young grub starts feeding between the upper and lower epidermis of the leaf making long and winding tunnels. Its life-cycle lasts about a fortnight. The pest is more harmful to young plants in seed beds. It is destructive both in the grub as well as the adult stage.

Control measures: The following control measures will be found effective on a field scale:

(1) As the pest spends some time on wild grasses before migrating to rice, the areas near the paddy fields where these grasses grow should be dusted with 5 per cent BHC.

(2) Infested fields may also be dusted with 5 per cent BHC at the rate of about 15 lb. per acre under expert supervision.

(3) The bunds of the fields should be kept clean and grasses as they grow should be uprooted and given to cattle.

PADDY GALL-FLY (Pachydiplosis Oryzae, W.)

This is a fly pest of paddy sometimes causing extensive damage to rice in Bengal, Orissa, Madhya Pradesh and Madras. It is a delicate mosquito like insect with long legs. The female fly lays eggs on the tender shoots of the paddy plant. The slender footless maggots that hatch out of these eggs enter the stem at the base of the growing point and as a result of the injury caused a silvery gall popularly known as the 'silver shoot' is produced.

Control measures: Being an internal feeder preventive measures alone will give better results in the control of this pest. The following control measures may be adopted:

(1) The bunds should be kept scrupulously cleaned and all wild grasses in the vicinity of the paddy field should be destroyed or dug up and fed to cattle.

(2) Light traps should be set up to trap the adults.

SMALL PADDY GRASSHOPPER (Oxya velox, F.B.)

It is a minor grasshopper pest found in most parts of India but occasionally responsible for a good deal of damage. Unlike *H. banian* the eggs are laid on the rice stubbles and less frequently in the field bunds when no stubbles are available. The eggs hatch in one to three weeks depending on the season. Ordinarily it is a pest of grasses but migrates to the rice fields if there is no grass available nearby. The nature of damage is exactly the same as in the case of *H. banian* and therefore, similar control measures may be adopted.

PADDY LEPTISPA (Leptispa Pygmaea, B.)

This is another minor beetle pest that is sometimes very serious. The life history of this beetle is almost similar to that of the rice 'hispa' and in whose company it is oftentimes found. It is more common in southern India and Bombay. The activities of this pest are worst in wet weather and in places of heavy rainfall. The control measures to be adopted are the same as in the case of the rice 'hispa'.

PADDY JASSID (Nephotettix Bipunctatus, FABR.)

This spotted paddy jassid sometimes assumes the form of a serious pest. Its occurrence in an epidemic form is very rare. Adults as well as nymphs suck and feed on the fresh green leaves and as a result of this the young paddy plants turn pale brown and ultimately wither away. In grown up plants the formation of ears is arrested. Large numbers of these adults are found on grasses during the summer months. The female lays 22 to 37 pale yellowish eggs in the tissues of the sheathing leaves. The total life-cycle occupies from 17 to 25 days.

Control measures: (1) Light traps may be set up to trap the adults.

(2) Dusting may be done with 5 per cent BHC at the rate of about 15 lb. per acre under expert supervision.

PLANT HORMONES

(Contd. from page 18)

killing plants which have an extensive root system and regenerate new plants from the underground parts.

HORMONE APPLICATIONS

The hormone applications have aroused a great deal of interest in the field of pineapple culture. The results achieved are most fascinating since the plant lends itself easily to such treatments in a remarkable fashion. On account of continued scientific research it is possible to induce flowering in the plant at any desirable time by regulating the time and concentration of the spray application. It is, therefore, possible to regulate the harvest dates of the various fields as the hormone applications result in a uniform ripening of the fruit. Thus such measures render the harmonious adjustment of labour, transportation and storage facilities to be an attractive feature of pineapple culture. It is through these practices that the law of supply and demand, which governs the price indices of commodities, is harnessed to serve the interests of growers and consumers alike.

The use of the chemical is not restricted to any one crop. Take for instance, apples; they can be sprayed during full bloom with a growth regulating material and fruit set can be inhibited. However, the degree of inhibition or thinning can be regulated by controlling the concentrations of the chemical in the spray. The quality, colour and size of the fruit in apples and pears, can be improved by preharvest spray applications of hormone which serve as a thinning measure. Such procedure has become a standard orchard practice.

The use of growth regulating substances is extended to the storage problems of perishable agricultural commodities, potatoes and onions. The research in this direction has received a great impetus from the high operational costs of cold storage facilities. So far the results have been quite encouraging. They have proven highly effective as sprout inhibiting agents on stored potatoes, onions and carrots. These vegetables can now be stored for a much longer period of time without sprouting at ordinary room temperatures. Such findings may be of great value in countries where cold storage facilities are limited.

The uses to which growth regulators can be put are varied and many. Growth inhibitors may, in the future, be important in controlling vegetation under the power lines and also in controlling growth of grasses in lawns and golf courses.

Another possible use of these compounds is to alter the chemical composition of plants, to improve the nutritional value of fruits and vegetables. Some day most of agricultural plants will be regulated from cradle to grave. We already have chemicals that will produce completely white or albino plants. Some other chemicals have been found that will increase the red colouring in the fruits.

These are some of the ways in which the use of these growth promoting substances is harnessed to serve humanity. So far only the surface has been scratched but we can look forward to much progress in the future.

INDIAN FARMING

Vol. III New Series No. 6 Sept. 1953

EDITOR'S PAGE AND EDITORIAL NOTES 2
MAN OF THE MONTH (Feature Article)—S. R. Sabhlok 4
ORANGE BORER OF WYNAAD 6
THE RED-HAIRY CATERPILLAR, AMSACTA MOOREI BUTLER AND ITS CONTROL—E. S. Narayanan .. 8
FIELD FRUITS ND VEGETABLES —Rampa Pal 10
POTATO DISEASES AND THEIR CONTROL—S. Ramanujam and M. J. Thirumalachar 12
BRISTLE INDUSTRY IN INDIA —L. M. Hira 16
SOME NEW AND NOTEWORTHY WHEATS—B. P. Pal 18
SELECTION AND MANAGEMENT OF RAMS—J. Jayaraman and B. B. Buch 20

★

EDITORIAL BOARD

Printed and published by P. H. Raman at the Associated Advertisers and Printers Ltd., 505, Arthur Road, Tardeo, Bombay 7.

(Agents for Indian Council of Agricultural Research, New Delhi.)

ADVERTISEMENT RATES

CURRENT:

CASUAL

Full Page	Rs. 450/-
1/2 Page	Rs. 225/-
1/3 Page	Rs. 150/-

CONTRACT CONCESSIONS:

6 INSERTIONS	12 INSERTIONS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

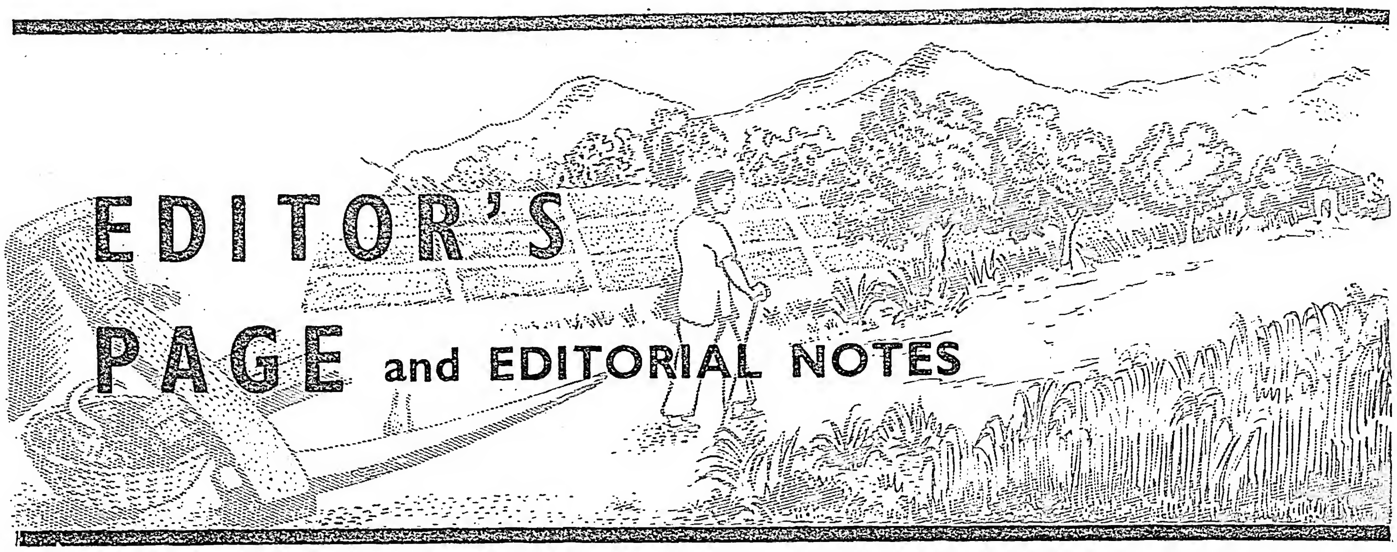
Effective from October 1952 until further notice.

SUBSCRIPTION RATES

Annas 12 only per copy
Rs. 9-0-0 for 12 issues
Rs. 4-8-0 for 6 issues

All Business enquiries may be addressed to the "Agents" at 505, Arthur Road, Tardeo, Bombay 7.

EDITOR'S PAGE and EDITORIAL NOTES



The world's most pressing need is to produce more food. If there is to be any general improvement in standards of living, there must be an overall stimulus to increase production in agriculture, forestry and fisheries in which about 60 per cent of the world's workers make their living. The position in Asia and the Far East is the more difficult, because it contains about half the world's population but grows only about a fourth of the world's agricultural production. This fact underlines the importance of the F.A.O. Regional Meeting for Asia and the Far East which was held in Bangalore from July 27 to August 5, 1953. The meeting was attended by representatives of 20 foreign countries and international organizations.

Dr. Panjabrao Deshmukh, leader of the Indian Delegation and later Chairman of the meeting, explained that the object of the meeting was to assess the work done since the last session of the F.A.O. Conference, so that appropriate action could be taken to advance the work of the F.A.O. The need of the region was to ensure adequate food production, because side by side with an expanding population were 'disquietening features' like under-production from land and the under-investment of capital in agriculture. While Dr. Deshmukh welcomed the greater flow of foreign capital and grants for developing agriculture, he expressed the view that in the final analysis, agricultural development depended upon millions of individual farmers. Therefore, he regarded agricultural extension and demonstration as work of the greatest importance. India has already launched an ambitious programme of community development and a National Extension Service Organization. By the end of the First Five Year Plan a quarter of the country would have been covered.

The shortage of rice is alarming, since rice is the staple food of this part of the world, which is most exposed to the threat of famine. The Committee, therefore, rightly devoted considerable attention to this subject, and recommended *inter alia* that the rice situation should be kept under review. If there was any likelihood of a disequilibrium between supplies and effective demand, the F.A.O. and the E.C.A.F.E should approach the governments of the region to initiate consultations in time to avoid any marketing difficulties. Another resolution endorsed the recommendations relating to the storage and processing of rice.

Protective foods like fish and milk were also discussed. In regard to the first, the meeting suggested that the Expanded Technical Assistance Programme should initiate programmes of coordinated research in fisheries and problems common to more than one government. As regards milk, it was agreed that experts should meet as soon as practicable to advise governments on improved methods of milk production and distribution.

Cash crops which constitute an important source of foreign exchange for this region, received atten-

tion of the Committee. It was agreed that because of the importance of such crops in the economies of the countries of this region, there should be a greater degree of price stability in the export markets. A recommendation is to be made to the F.A.O. Conference to be held in Rome in November this year to take measures towards this end.

Another recommendation suggests assistance from the F.A.O. to member governments, for examining feasibility of utilizing buffer funds and buffer stocks for stabilising farm prices and farm incomes for the region as a whole.

The meeting paid a signal tribute to the work of Indians in the field of agricultural statistics, by approving a proposal for a training centre on experimental design and sample surveys, to be held in India next year, under the joint auspices of the Government of India and the F.A.O. It is earnestly hoped that financial and other considerations will not stand in the way of a consummation of the scheme.

Little by little, through international effort and joint endeavour, the world is advancing towards the goal of freedom from hunger.

ERRATA

Indian Farming, July, 1953 *issue*

Page 16 col. 3, lines 11-14

For "The cashew apple which is the swollen stalk of the nut is the true fruit and is eaten in its fresh condition."

Read "The cashew apple is the swollen stalk of the nut, (which is the true fruit) and is eaten in its fresh condition."

Page 32, col. 3, line 23 from below

For "....to determine the true features ......"

Read "....to determine the tree features ......"

OUR COVER

TRANSPLANTING OF PADDY AT THE FARM ATTACHED TO CENTRAL RICE RESEARCH INSTITUTE, CUTTACK

Shri Amin Chand

MAN OF THE MONTH: AMIN CHAND — THE PROGRESSIVE ORCHARDIST OF HIMACHAL PRADESH

By
S. R. SABHLOK

THE hilly regions of the Himachal Pradesh are the places where it is usually difficult to make a comfortable living by farming. But this remark does not obviously apply to Shri Amin Chand, who by dint of sheer hard work and sustained effort, has raised one of the finest apple orchards at Kotgarh, about 50 miles from Simla on the Hindustan-Tibet Road. He belongs to a peasant stock of this hilly region and comes from the interior of the Mahasu district. He has served in various capacities in the Revenue Departments of the Punjab before 1947 and afterwards in Himachal Pradesh. Throughout his official career, however, he nursed his interest in farming and took to it as a hobby.

AN UPHILL TASK

After his retirement from service in 1948 Shri Amin Chand was in the quest of a full time job and his choice naturally fell on farming—the avocation of his ancestors. At the advanced age of 60, he undertook to reclaim a 15-acre plot of land which he had acquired in the heart of a forest in the suburbs of Simla. This enterprising farmer can now boast of having carved a beautiful farm out of the land which was previously covered with jungle and was exposed to the depredations of monkeys and other wild animals. The farm is easily accessible from Simla and can well serve as a model farm for demonstration purposes.

Peasants whose lands are situated in the forests, are usually confronted with many difficulties in carrying out agricultural operations. Shri Amin Chand had also his difficulties, but he has successfully solved all his problems by constant hard work and sound judgment. The land which he set out to reclaim was slopy and was practically studded with pine trees. There was also abundant undergrowth

Shri Amin Chand examining a three-year old peach tree

of thorny bushes. Being fully conversant with the problems of soil erosion, he worked the slopes into small terraces. This was the first step of his developmental plan. The planting of trees was taken in hand during the later part of 1950. In addition to the plants raised at his own nursery, he also used grafted plants of superior quality which he had imported from various nurserymen of established fame in America and Japan.

At present, Shri Amin Chand has a plantation of nearly 1,000 healthy trees of apple, peach, plum, apricot, thin-shelled walnut, Japanese persimmon, cherry, pecan, almond and pear. These plants are practically free from any disease and their growth is so vigorous that some of them have already started bearing fruit within a short period of three years.

A NURSERYMAN TOO

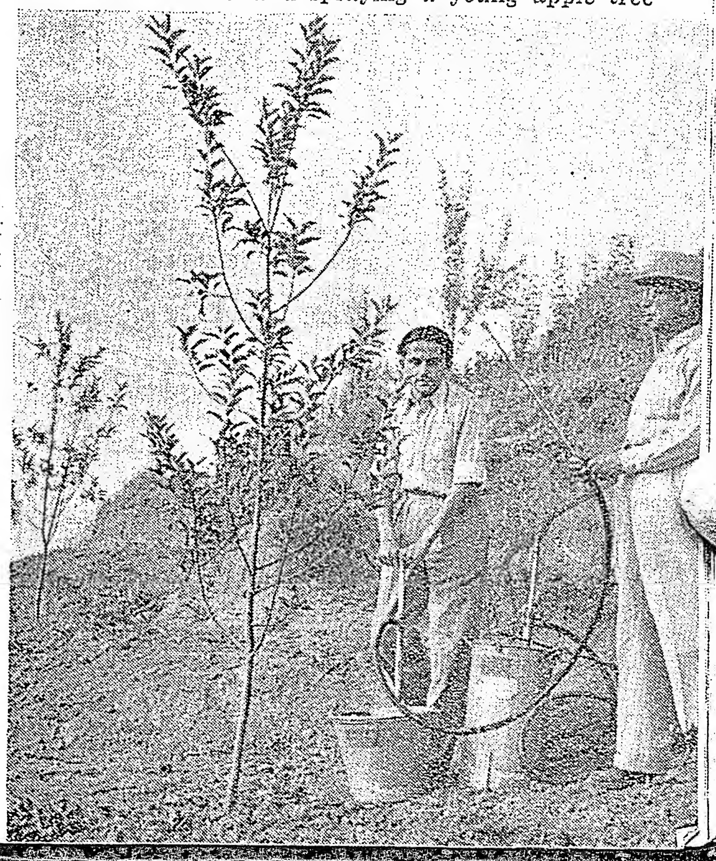
Shri Amin Chand is also a devout nurseryman. About 40,000 seedlings are ready with him for grafting with superior types and no less than 3,000 grafted plants of the famous golden, red and royal varieties of apple are ready for sale this year. Shri Amin Chand maintains this nursery strictly on scientific lines. Infestations of insect pests or attacks from diseases commonly associated with fruit nurseries have hardly ever occurred. In carrying out this work, Shri Amin Chand gets technical advice from experts which he follows in detail.

The introduction of cover-crops in the general scheme of cropping together with the manufacture of compost manure—for which half a dozen pits have been dug at the farm, have enabled Shri Amin Chand to retard the pace of erosion and to steadily build up the fertility of his land.

A steep hill-slope converted into terraced orchard by Shri Amin Chand

A compost trench on the farm

Shri Amin Chand spraying a young apple tree



ORANGE BORER OF WYNAAD

THE 'mandarin' or the 'loose jacket' is one of the most popular varieties of citrus fruits grown in Madras State. The area under this fruit crop has been increasing. In Wynaad the 'mandarin' is grown on a large scale. But a great menace to the crop is the orange borer. As such, investigations on the control of orange borer beetle (*Chelidonium argentatum,* Dalman) were undertaken.

LIFE HISTORY

An adult measures a little over an inch in length and is of a dark metallic green colour. An allied species — *Chelidonium cinctum,* Guer occurs exclusively in parts of Mysore and Coorg. At Wynaad; the adults emerge soon after a few heavy showers of rain during June-July and mate. The female selects convenient places like the forks of young twigs, the angles of the thorns, etc. and lays her eggs singly in such spots. The grubs hatch out in about 10 to 12 days and begin to bore into the stem forthwith. They first make a spiral cut through the woody portion of the stem. The effects of this injury are evinced by the wilting of the portion of the branch beyond the point of entry. The young grubs burrow their way up for a period of two to six weeks, after which they reverse the direction of their progress, eventually reaching the thicker branches and the main stem. During the course of their destructive work, the grubs carve out a few small openings in the branches and the trunk for ventilation. The openings at the appropriate time serve as exit holes for the adults. Considerable quantities of chewed fibrous matter are thrown out through these openings. The larval period extends to about eleven months. The full grown grub is pale white in colour and about an inch and a quarter in length. It later pupates inside a cocoon and emerges as an adult in the course of about three to four weeks. There is thus only one brood in a year. As already explained, the damage is caused by the grubs boring extensive and tortuous tunnels in the sapwood of the tree and feeding on its contents.

CONTROL MEASURES

Insecticidal measures were attempted but they were neither efficient nor practicable. A mechanical method evolved by the Mysore State Entomological Department was given a fair trial. This method consisted mainly in systematic removal of the wilted twigs, with the help of a long pole with a forked end. As has been stated before, the adults emerge in successive broods throughout the rainy months of June and July; so also the wilting of the twigs may exhibit a striking correspondence with the emergence of the broods. The removal of the twigs should, therefore, commence by July and continue till August or September. The approximate cost of such treatment may work out to about four rupees per acre.

In case the initial method of control is neglected, the damage by the grown up borers will manifest itself by the ejection of chewed fibrous matter through the bore-holes by about December-January. Pumping in small quantities of petrol into the bore-holes, either with a hypodermic syringe or oil can and blocking them with a little clay or earth has been found to give considerable relief. Here again it may be necessary to give the treatment at least thrice for complete extermination of the grubs. The total cost of such treatment may work out to about nine pies per tree.

Despite the efficacy of syringing, the removal of the wilted twigs is considered to be more suitable as it is cheaper and contemplated to nip the pest in the bud, before the grubs are allowed to cause any damage to the tree.


washed WHITE
washed BRIGHT
thanks to
SUNLIGHT SOAP
WASHES CLOTHES
WHITE AND BRIGHT
WITHOUT BEATING!
SUNLIGHT SOAP
S. 206-50

SEASONAL PESTS OF CROPS:

THE RED-HAIRY CATE and its CONTROL

By
E. S. NARAYANAN,
Head of the Division of
Entomology, I.A.R.I. New Delhi

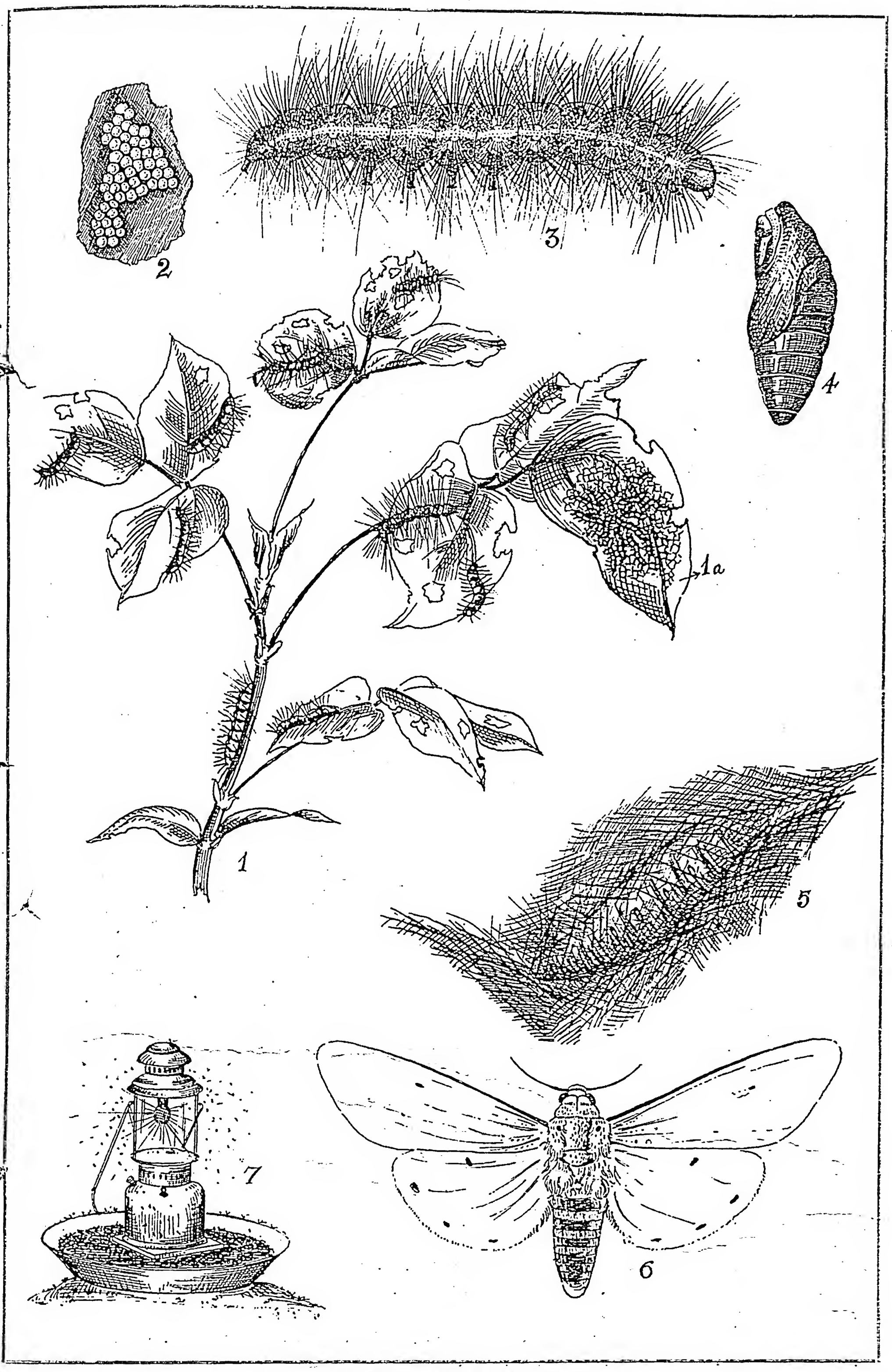
ONE of the fascinating problems in applied entomology is the one that deals with the origins and causes of insect outbreaks. There are several agencies or factors that govern the outbreaks of insect pests and perhaps the most important of them is the complex of meteorological factors constituting climate in which temperature, humidity and light are separable as distinct factors. As Uvarov observes, "Climate is the ever present factor in insect life." Late in June or early in July when the grey overhanging clouds release the first of their unshed showers and herald the advent of the monsoon a variety of insect pests awake from their long sleep and become active once again. This is because there is an optimum range of temperature and humidity at which a very large number of insects complete their normal development and emerge as adults. As this optimum range of temperature and humidity prevails from July to the end of September we observe a revival of great insect activity during this period. One of the earliest of the destructive insect pests that responds to the call of first monsoon showers is the red hairy caterpillar well known to our peasantry as *kutra*. Though most unwelcome they are regular visitors year after year; only their numbers vary.

The red hairy caterpillar is a serious pest in the *kharif* season when the cultivators have just sown their crops and the plants have grown to some height. These caterpillars feed on a number of plants like *jowar*, maize, *urid*, *til*, *bajra*, *govi*, *moong*, *guar*, *luffa*, cotton, sann-hemp, groundnut and all kinds of fodder grasses. This polyphagous habit renders them all the more serious. The pest has been reported from the Punjab, Delhi, Bombay, Uttar Pradesh and Madhya Pradesh in the North while an allied species *Amsacta albistriga* Walker is met with in the South in Madras and Mysore. The pest has not been recorded from outside India so far. It is commonly known as *kutra*, *kantra* and *kimilla* in the North while in the South it is known as *kumbli-puchi*. Although the pest appears year after year its occurrence in an epidemic form resulting in severe damage to the *kharif* crops has been observed only during certain years. The pest makes its first appearance after a few showers in the beginning of the monsoon season which is generally late in June or early in July. In the North the damage to crops is mostly caused by the first brood during July-August while in the South the damage caused is more by the second or third brood that make their appearance much later. The moths which are conspicuously white in colour with small black dots on the wing start emerging in the field from the hibernating pupae soon after the first showers and continue emerging till about the end of July. During the day time they lie hidden under dried leaves or twigs and come out at nights when they are greatly attracted to lights. The moths mate soon after emergence and the female lays eggs in hundreds in batches and it has been observed that sometimes these eggs total over a thousand. The eggs are light yellowish in colour and are generally laid at night mostly on the under-surface of leaves of any vegetation. Sometimes they lay eggs on the upper surface of the leaves also. Indeed they even lay eggs on soil in clusters as their instinct is to release the eggs from the abdomen that are full of them. The eggs are very conspicuous against the green back ground of the leaves on which they are usually laid. These look like poppy seeds from a distance. The eggs usually hatch in four to five days and the tiny larvae immediately after hatching congregate together and start feeding on the under-surface of the leaves and so escape the notice of the farmers. They, however, very soon part company and each caterpillar makes its lonely way in the fields, bunds and paths in search of food. As the caterpillars grow older they become deep orange in colour and are covered with thickly set hairs all over their body. It is at this stage that they are detected by the farmer in the field. They sometimes crawl in the houses and farmsteads and become a nuisance to the inmates. The caterpillars walk fast in the field and make a meal of the germinating crops that lie in their way. They cut the seedlings at the growing points as a result of which the seedlings wither and die. Resowing of the crop in such cases thus becomes necessary. The caterpillars are very sensitive and curl themselves even when gently touched and cleverly feign death. When, however, the danger is past they become their own self once again and continue to cause destruction. The full grown larva measures about two and a half inches in length and the larval period lasts about three weeks. When full grown the larvae cease feeding and go deep under the soil for pupation after spinning for itself a cocoon in the making of which the larval hairs are also generously made use of. The pupal period lasts for about a week. The pest has got at least two generations a year in the North and three in the South. A small proportion of the second generation larvae pupates and emerges as adults in October but the bulk of the larvae pupate under the soil and remain hibernating till the advent of the monsoon next year when they start the life-cycle afresh.

CONTROL MEASURES

As the moths are very much attracted to light the rational and effective method of control lies in trapping these moths in light traps. Petromax or where these are not available, even ordinary

ERPILLAR, AMSACTA MOOREI BUTLER



AMSACTA MOOREI BUTL.

1. An urid plant showing damage by caterpillars
1a. Congregation of freshly hatched caterpillars on a leaf
2. Egg cluster
3. Full-grown caterpillar
4. Pupa
5. Cocoon under which caterpillar pupates
6. Adult moth (female)
7. Light trap with dead moths in the vat

hurricane lanterns may be used for the purpose. While the power of the petromax lamp is effective for about ten acres of land, the power of the ordinary hurricane lantern would be effective only within a range of about three acres. The lights are to be put up in the field in a vat of kerosinised water. The vat is kept on a raised platform and in the centre of the vat the petromax or the hurricane lantern as the case may be is kept on a piece of heavy wood or any other suitable rest. The lamp should be lighted as evening sets in. Large numbers of moths both males and females, will be attracted to the light trap and get killed by falling in the kerosinised water. They are generally attracted in large numbers on warm, quiet and dark nights. The light trap should be set up as soon as the moths of the first generation start emerging in the field in June or July and may be continued as long as the moths emerge. The following are the other control measures that may also be carried out on a field scale to keep down the depredation by the pest:

(1) The fields after the *kharif* crops have been harvested should be ploughed deep. This will kill many of the hibernating pupae by mechanical destruction as also expose them to preying by birds and attack by beneficial parasites.

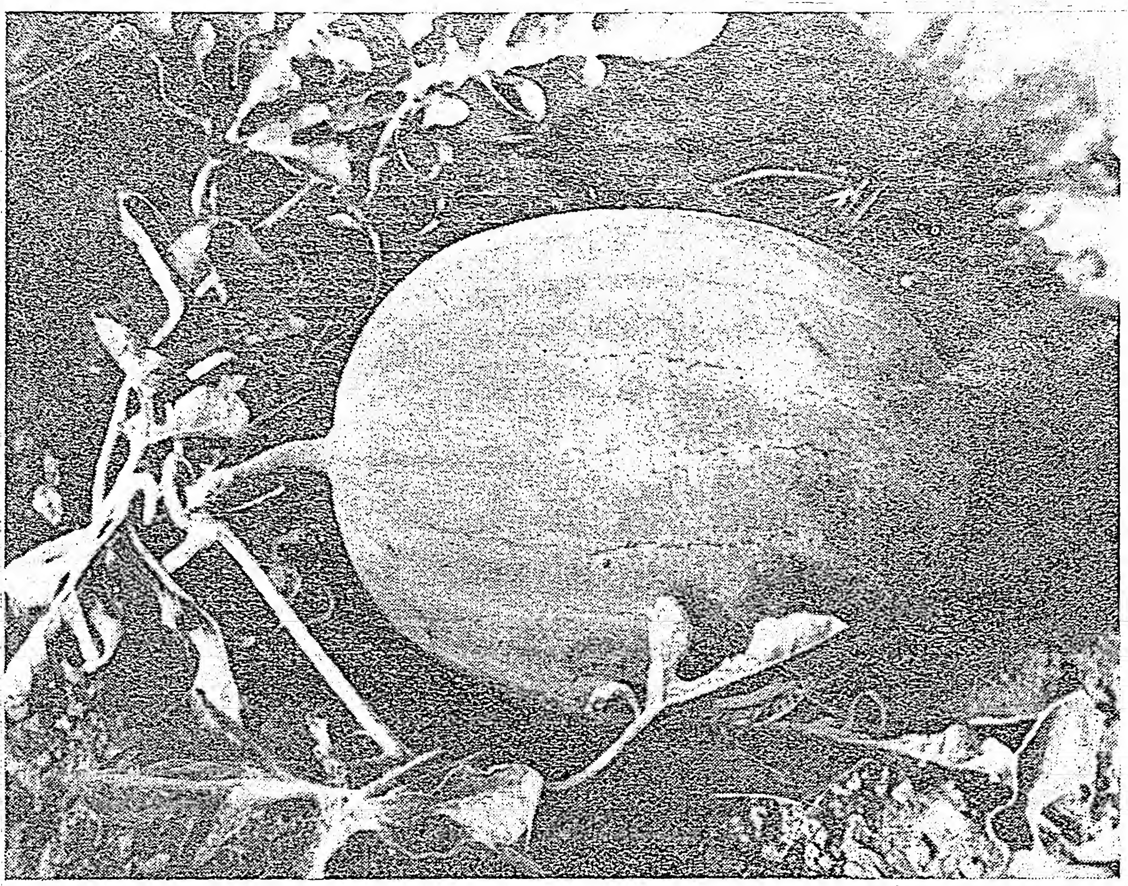
(2) The egg masses of the first generation should be collected as far as possible and destroyed. As the egg masses are laid on leaves or grasses quite near the surface of the ground and are quite conspicuous objects, this work can be entrusted to even small boys who may be trained for the purpose.

(3) Trenches eight inches deep and ten inches wide may be dug around the cultivated fields to protect them from the invasion of the marching caterpillars that usually are unable to crawl up such trenches.

(4) If the outbreak of the pest is very serious, dusting may be done with sodium fluosilicate mixed with road dust in 1:8 parts by weight. Dusting may also be carried out by four to five per cent BHC at the rate of about 10 lb. per acre under expert supervision.

fiel

By
RAMPA PAL



Tarbuz (Water melon)

SUMMER brings a variety of field fruits and vegetables which are the cheapest in the market. They are also delicious, and contain amongst other things mineral matter and vitamins. The water melon (*tarbuz*) and the musk melon (*kharbooza*) are great favourites in the season. Cartloads of water melons may be seen arriving from the countryside while the pavements and street corners are covered with huge heaps of *kharboozas* of all varieties and colours. The best among the *kharboozas* is the small pale yellow, delicious, white-fleshed variety known as Lucknow *sufaida*. The others are of many hues and shapes—striped, round, ovoid. They may have netted, rough or smooth surfaces. They may also have distinctive flavours. Those from the drier districts are generally very sweet and fragrant.

Both these fruits are wonderfully cooling, colourful and satisfying. Their seeds, along with those of cucumber and other similar fruits are known as *magaz*, and are used in the preparation of summer drinks, tonics and *halwas*. Country children are experts in drawing out the seed kernels from the tiny, narrow seed sheaths with their fingers. The whitish flesh of the melon lying between the red pulp and the rind, too, is often used as a vegetable. The melons do not have high food value but they contain a large quantity of water (over 90 per cent) and mineral salts and, therefore, provide healthy and refreshing drinks to take in the hot summer months, viz. April, May and June.

The water melon is one of the largest among field fruits and often weighs from 40 to 50 lb. Water melons are light green in colour with stripes or dark green all over and have rich, red, juicy pulp. Its seeds go to make *magaz* and are eaten as a delicacy in China. In the hot months, market corners and streets in this country have the water melon seller with his *rehri* (hand-cart) handing out tempting thin—cut so fine that they are less than ¼ inch in width—red and crisp slices at a very cheap price. Fatter slices chilled on top of an ice slab fetch higher prices. Small chunks or cubes of red melon pieces in crushed ice with a sprinkle of granular sugar in cut-glass bowls are a summer delight. Melon *sherbet* is a delicious squash. It is made by cutting up small pieces of the melon flesh and squeezing out the juice to which some sugar, a few drops of *keora* or rose essence and crushed pieces of ice are added. It is served with three or four pieces of the flesh floating in the liquid.

The whitish flesh between the rind and the red pulp is cooked as a vegetable dish in much the same method as *gheeya* or pumpkin. In Australia, melons are also used in jam making.

The water melon and the musk melon are found growing together at the same time all over North India and in the dry belts of South East Asia. In the Middle East, and Western Asia they are favourite fruits as in India. They do not thrive in the rains which mark the end of their season. One big monsoon downpour is enough to rot and ruin the crop.

In Europe the water melon grows as far west as France while in the U.S.A. it is widely cultivated and is much relished by the people there. They have evolved smaller and newer varieties. The one illustrated here is the fruit obtained from an improved American strain grown at the Indian Agricultural Research Institute. It may be noticed that it has

d fruits and vegetables

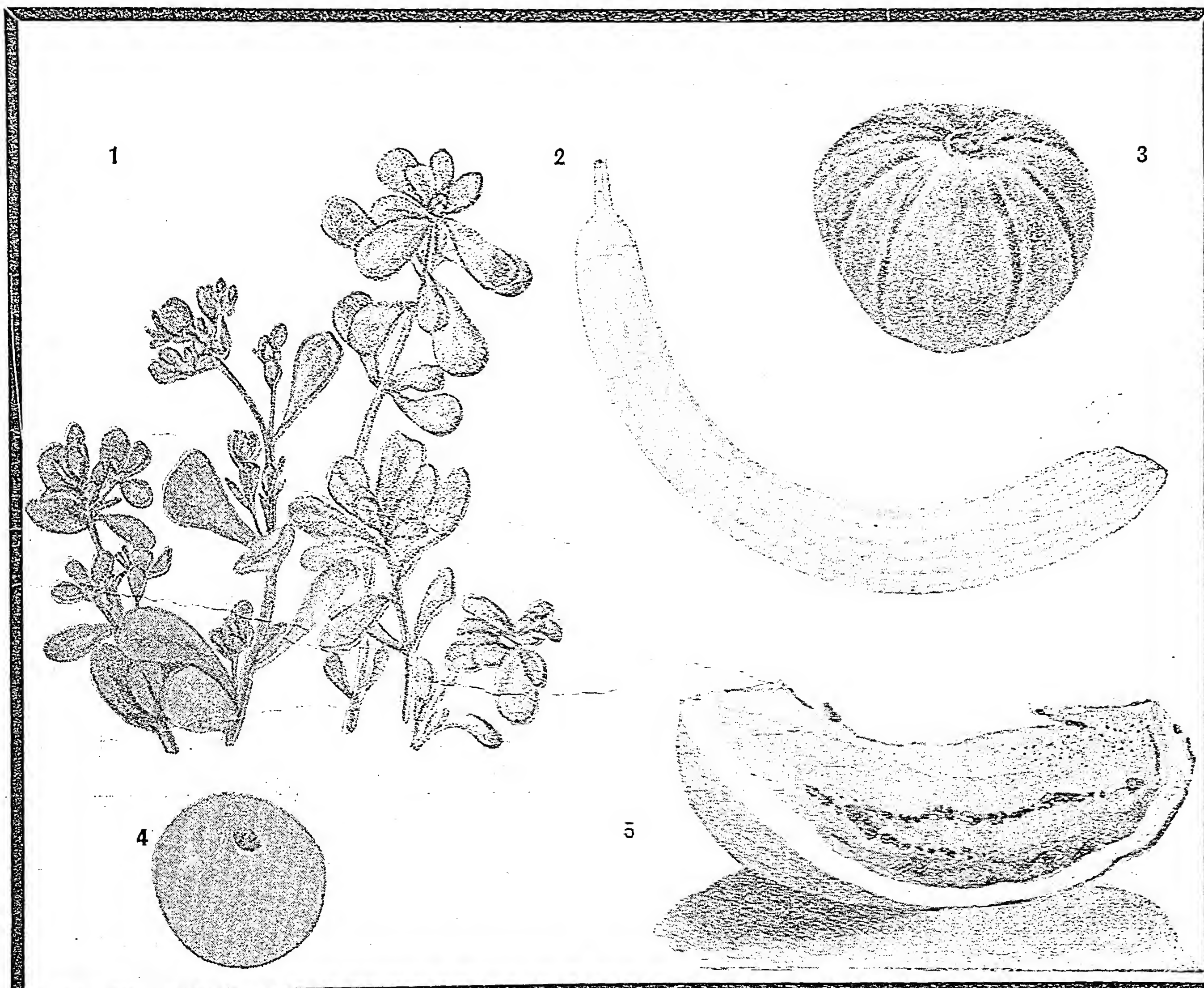
very little white layer of flesh between the rind and the red pulp and the seeds also are fewer in number.

Along with these fruits, we have also vegetables growing on vines and fruiting in summer. They have cooling and refreshing qualities. These come into season simultaneously with the melons and in fact, they belong to the same family of plants-as the melons, particularly *tinda* and *kaddu*. The cucumbers, *kheera, tar, tinda,* pumpkin, *gheeya* (also known as *lauki*), ridge-gourd, snake-gourd, bitter gourd and vegetable marrow also come into season at this time. They have a high moisture content. Some of the vitamins and other nutritive factors are present in them. They are much in demand as summer vegetables.

A good many leafy vegetables and greens also grow during summer. The earliest is the *kulfa*. Its very name means cool. It is slightly acidic in taste. Tender Amaranth or red cholai is among the greens having the highest food value. It has iron, calcium, protein, vitamins A, B and C in large quantities. In comparison the spined cholai is not so high in food value. The tender stem tips of *gheeya*, pumpkin and *lobia* and sometimes their young leaves are also cooked in soups or as plain vegetables.

With the coming of rains, other greens and *sags* like *poi*, *Ipomea* or *karmi*, *bhakra* and wild clover come into season. They have the usual mineral salts and refreshing qualities and ought to be included in our summer time menus.

(1) Kulfa Saag (Purslane), (2) Tar (Long Cucumber), (3) Kharbooza (Musk melon), (4) Tinda (Round gourd), (5) Water melon slice.



POTATO DISEAS

By
S. RAMANUJAM and M. J. THIRUMALACHAR,
Central Potato Research Institute, Patna

THE potato is subject to a number of diseases, which causes reduction in yield of the crop in the field and loss of tubers in storage. The diseases are caused by fungi or molds, bacteria and viruses. While some diseases cause considerable damage, others are only of minor importance. Again, some diseases are more important in certain regions than in others. The cheapest and the most effective method of control of these diseases is to grow resistant varieties but these are not always available. They have to be produced by the breeder; the process, however, is time-consuming and complicated involving very often hybridization of distantly related varieties. While, therefore, the search for resistant varieties goes on, protective and control measures have to be devised for minimising losses. In western countries such measures have been evolved for many diseases and are being applied on a large scale with great benefit to the potato growing industry.

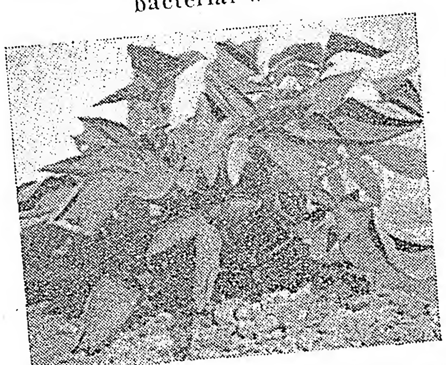
In India, where potatoes are grown under a variety of conditions, a thorough and systematic survey and study of the various diseases of the potato and their relative importance in causing damage to the crop, have not been made, although some work has been done in this connection by workers in the various State departments of agriculture and the Indian Agricultural Research Institute, New Delhi. Adoption of control measures against the diseases has not yet become popular. Since the control of diseases offers a sure means of increasing yields, a systematic study of this aspect was undertaken by the Central Potato Research Institute since its inception in 1949. The work consists of two parts: (i) survey and identification of the diseases of potato, which occur in the country, with a view to cataloguing them in the order of their importance in causing damage to the crop; this work is being done by actual field surveys by the staff of the Central Potato Research Institute during their visits to the different centres of potato cultivation and by obtaining samples of diseased plants from the various State departments of agriculture and (ii) detailed study of some of the major diseases with a view to devising control measures.

In order to enable the growers to recognise the diseases and adopt suitable methods of control, wherever they are known, a brief description of the diseases and the methods of controlling them are set out in this paper.

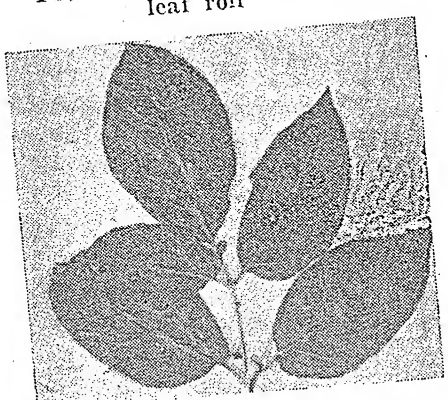
LEAF AND STEM DISEASES

Early blight: This disease is caused by a fungus known as *Alternaria solani* (Ell. and G. Martin) Jones and Grout. It is so called because in the western countries it occurs earlier in the season than late blight, a disease also caused by a fungus. In our country, in the plains of North India, wherein lies the bulk of the potato production, it actually

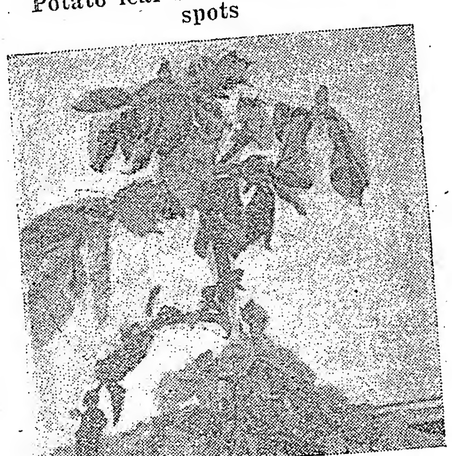
Potato plant affected with bacterial wilt



Potato plant affected with leaf roll

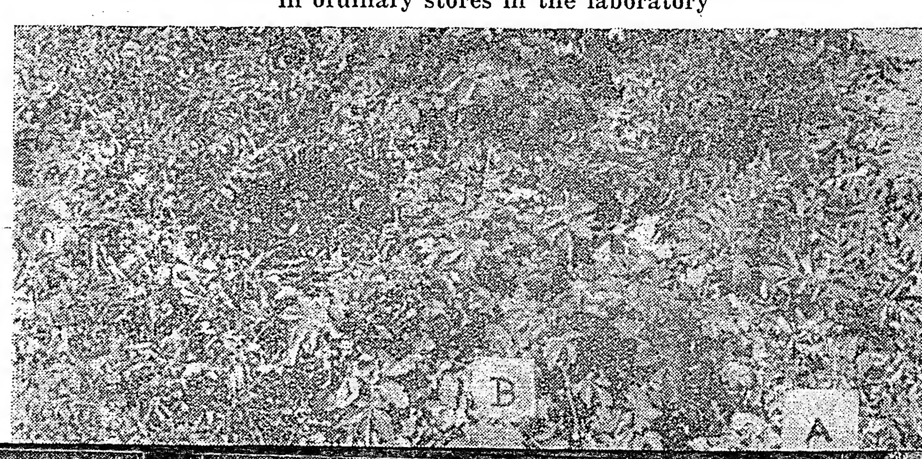


Potato leaf showing early blight spots

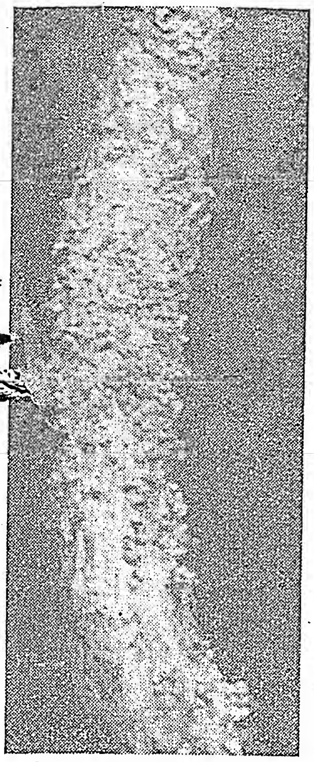


Potato plant showing early symptoms of 'Ozonium' wilt

Phulwa variety of potato—(A) Leaf roll-affected plants from seed stored in cold store; (B) healthy plants from seed stored in ordinary stores in the laboratory



ES AND



An enlarged view of the basal portion of a potato plant affected with 'Ozonium' wilt

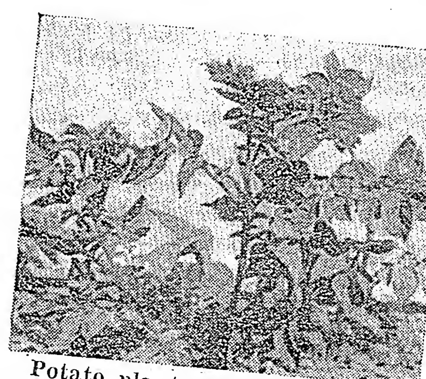
Spraying a potato field against late blight and (inset) Healthy potato plant with flat, soft and flexible leaves

THEIR CONTROL

occurs late in the season, so that the early planted main crop does not suffer very much from this disease. In Bihar, the incidence of this disease is very much higher in the late planted *katwa* crop; this crop is planted during late November and sometimes in the beginning of December. On the hills, however, the damage may be generally severe and the plants have to be protected against the disease to minimise losses.

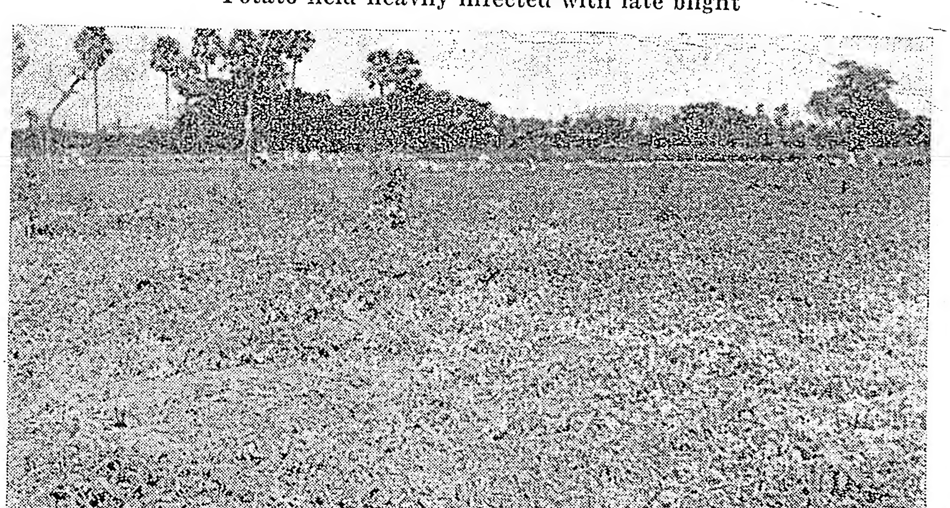
This disease attacks the potato leaves causing brown spots which develop concentric rings. As these spots enlarge and merge together, the entire leaf is frequently killed and consequently, there is a reduction in yield. Sometimes the disease also attacks the stem. The extent of the reduction in yield depends on the time of appearance of the disease and its severity.

Control measures: Timely and thorough spraying with fungicides

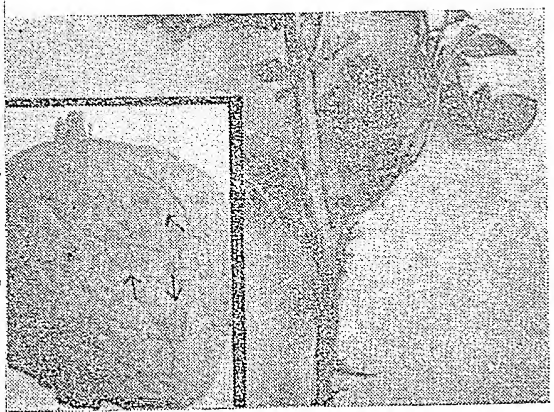


Potato plant showing severe mosaic infection

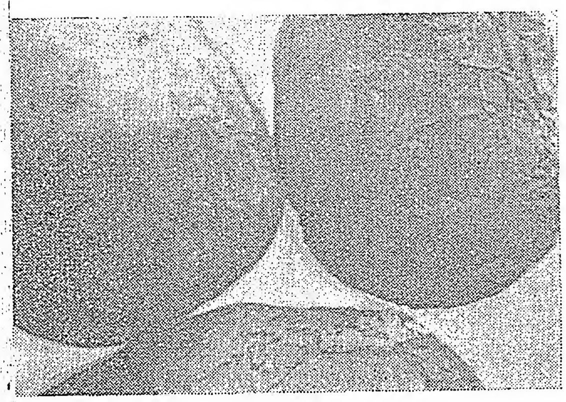
Potato field heavily infected with late blight



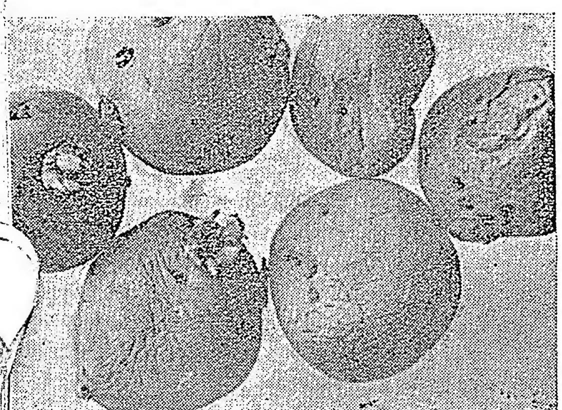
Shoots of a potato plant showing 'Cercospora' leaf spot and stem canker



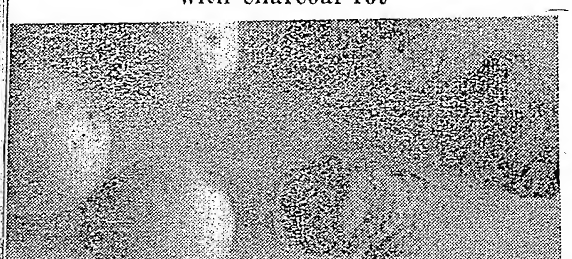
(Left) Potato tuber affected with black scurf
(Right) Potato shoot showing the basidial stage of the fungus causing black scurf



Potato tubers affected with late blight fungus



(Left) Healthy tubers
(Right) Tubers affected with charcoal rot



(Left) Healthy potato tubers
(Right) Tubers affected by dry rot

like Bordeaux mixture, Perenox or Diathane-D-14 has been found to control the disease to a great extent.

Late blight : This is one of the most destructive diseases of potato, as it causes, under favourable conditions, a rapid blighting of the crop in a few days. It is caused by the fungus *Phytophthora infestans* (Mont.) De Bary. It is widely prevalent in the crops raised in the hills of North India. It is reported to be particularly severe in Darjeeling. It is, however, not important in the Nilgiris in the South India. Its occurrence was not reported in the plains of North India for a long time. It is, however, reported in recent years to be prevalent in the crops in Uttar Pradesh and Bihar. In the Patna City area in Bihar, where about 3,000 acres are under seed potatoes, this disease is now known to occur every year by about the end of December or beginning of January, and causes considerable damage to the crop. The cultivators have rightly called this disease by the name of *afat*, which means calamity. Usually, by the end of December or the beginning of January, there is a shower and this brings on favourable conditions for the rapid spread of the disease.

Symptoms: On the leaves irregular water-soaked areas appear, which turn brownish black and dry up. On the under-side of the infected patch a white fluffy growth of the mold may be seen. When the weather is rainy and cold, the disease spreads very rapidly in the fields. On the stem, the water-soaked symptoms are less marked than on the leaves and appear as purplish black stripes running lengthwise on the stem. The cultivators are usually able to recognise the disease by the moldy odour it emits in a severely attacked crop.

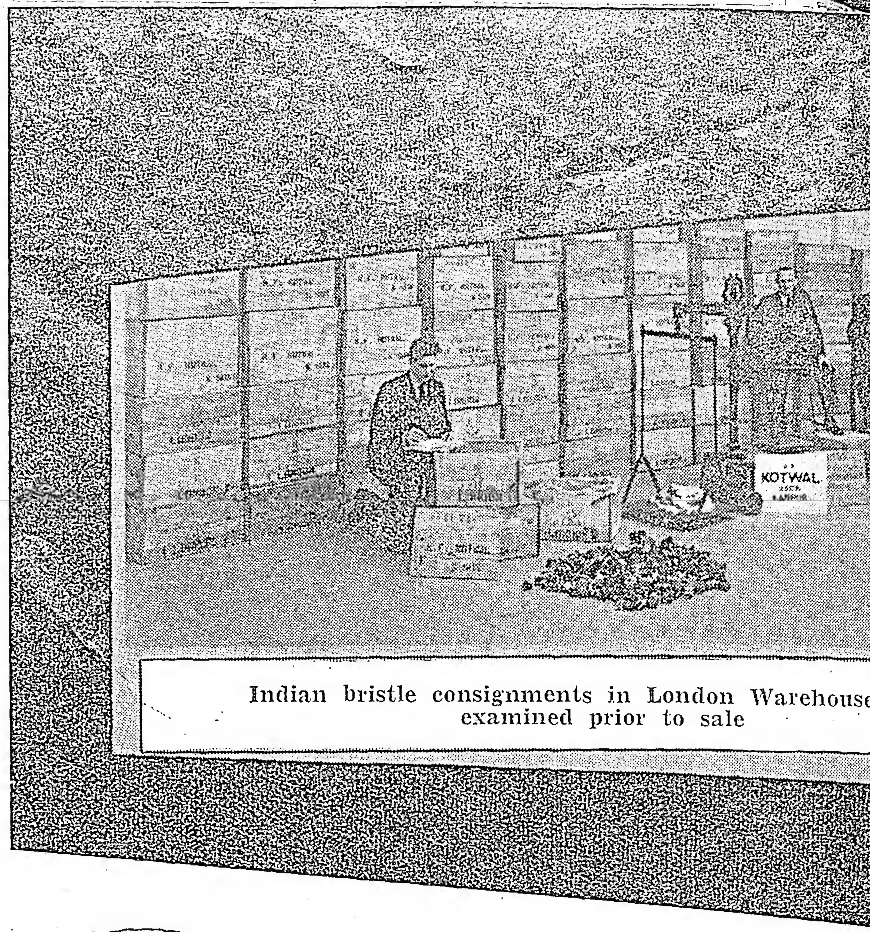
The tubers are also attacked by spores which are washed down into the soil from blighted tops. The infection symptoms on the tuber may be slight or none at all at the time of harvest but develop during storage. At first the infected portions appear as purplish brown discolourations which extend beneath the skin into the flesh of the tuber. The infected portions shrink and develop a sort of dry rot later during storage.

Control measures: Spraying with Bordeaux mixture, Perenox or Diathane-D-14 has been found to successfully control the disease. The spraying should begin about the middle of July in the hills and should be continued depending on weather conditions. The foliage should be thoroughly covered with the spray mixture. It is advantageous to add a sticker to the spray mixture, especially in regions where rains are likely to wash off the mixture.

In the plains, usually two to three sprayings are sufficient: the first spraying should generally be completed by the end of December when weather conditions are most favourable for the spread of the disease; the second spraying may be given by the middle of January and a third, if required, by the end of that month. It will be necessary to determine the areas in the plains where the disease occurs and undertake sprayings.

The Central Potato Research Institute, in cooperation with the Bihar Department of Agriculture, undertook the control of late blight in an important seed growing area in the Patna City in a block of 100 acres in cultivators' holdings during 1950. A large number of power sprayers, hand sprayers, etc. were assembled and Perenox (a proprietary product of the Imperial Chemical Industries, having copper oxide as the chief ingredient) was sprayed on the crop three times. The first spraying was completed on 15 December, 1950; the second lasted from 5 to 15 January; and the third from 15 to 23 January, 1951. The disease in the sprayed plots was completely checked while that in the unsprayed area all round, which appeared on 30 December, 1950, spread rapidly and completely destroyed the crop. The yields from the sprayed plots were found to be from 50 to 70 maunds more per acre than those from the unsprayed plots. The cultivators were thoroughly convinced of the efficacy of spraying and have taken to it for controlling the disease. During 1951-52 and 1952-53, the cultivators had their crops sprayed by the State Agricultural Department by contributing Rs. 15

(*Contd. on page 22*)



Indian bristle consignments in London Warehouse examined prior to sale

Bristle In

IT is not generally known in this country that the tooth and shaving brushes and other articles of brushware are made out of hair, called bristles in the trade, obtained from live hogs, pigs or wild boars. The commercial importance and intrinsic value of bristles are not appreciated with the result that there is much of wastage in that bristles are either not plucked at all or allowed to be wasted or burnt.

BRISTLE PRODUCTION IN INDIA

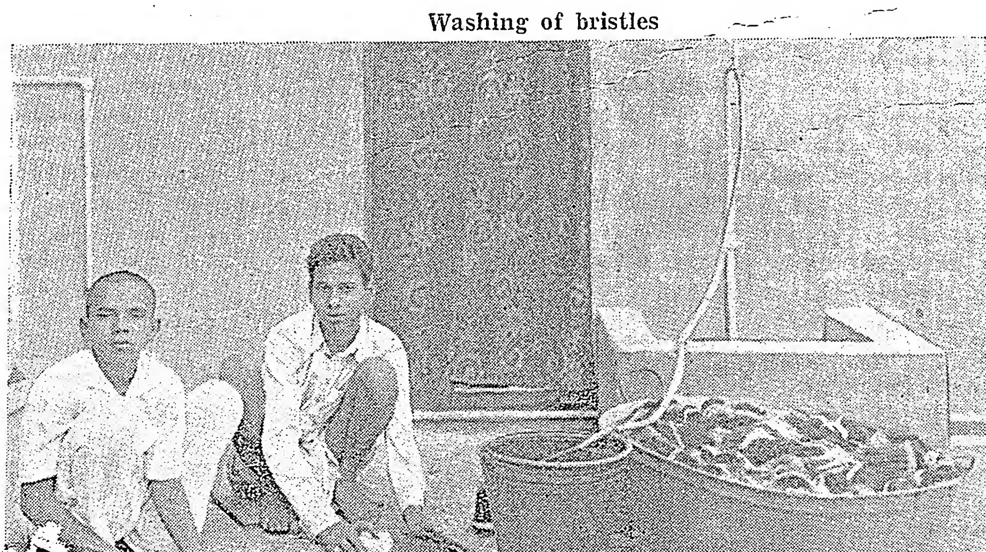
Pigs are found practically in all parts of India. The number of pigs in the Indian Union, according to the 1951 census, is known to be roughly 46 lakhs. Due to variations in climatic and topographical conditions, the production of bristles varies widely in different parts of India. Bristles are plucked from living animals once or twice a year. They are also pulled out from dead or slaughtered animals. Short hairs left in the pig carcases are, sometimes, shaved and collected. Indian bristles vary in texture from soft and medium to stiff and extra stiff. No accurate data are available regarding bristle yields. The yield and quality of bristles depend on the breed of pigs, the locality and the climate. The yield is, however, reported to vary from four to six ounces per pig per annum. The annual production of bristles in India is roughly estimated to average between five and six lakh pounds, valued at over one crore of rupees.

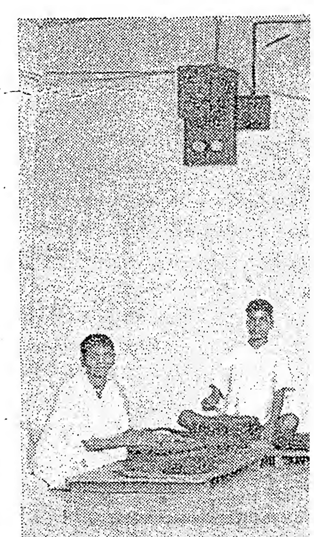
UTILIZATION AND DEMAND

Bristles are largely used for making various types of brushes, such as those used for toilet, cleaning clothes, floors, etc., polishing, painting and other industrial purposes. They are also put to various other uses, viz. wrapping, stuffing and covering of cricket balls, quilts and mattresses, stitching shoe soles, foot balls, etc.

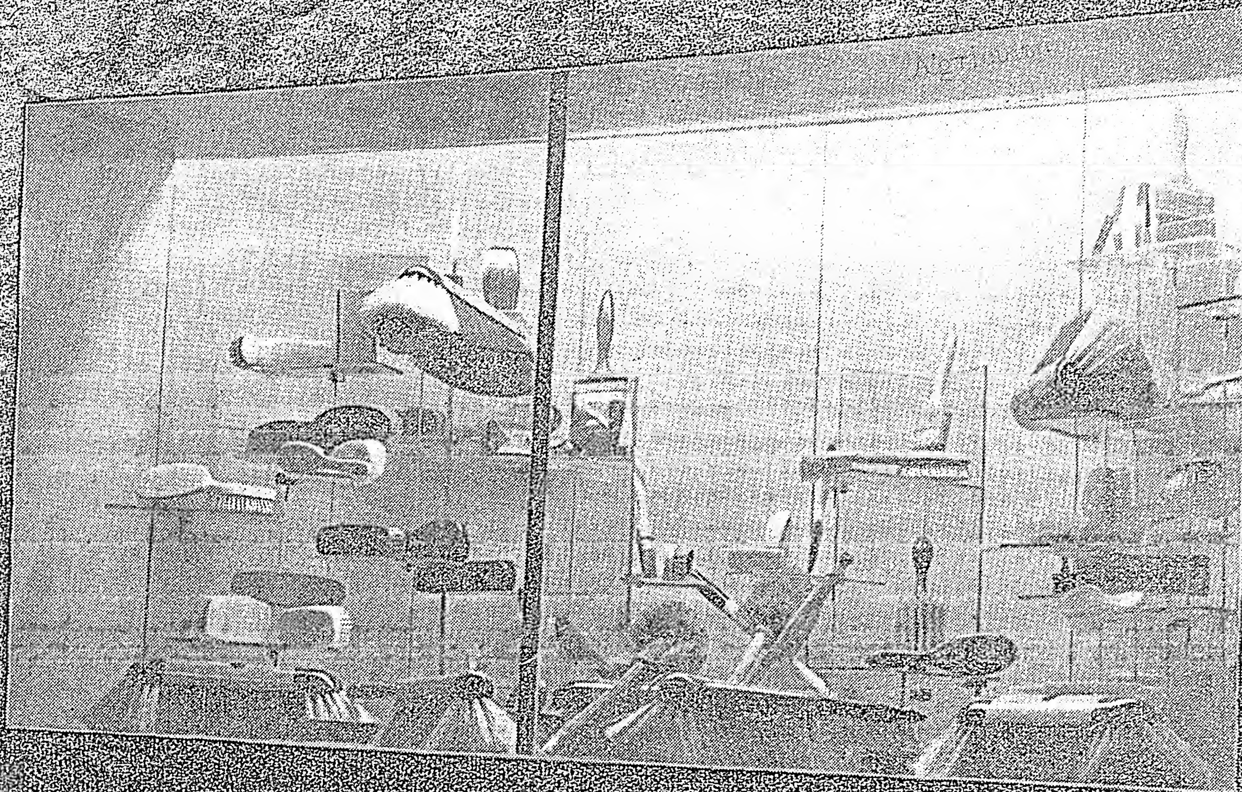
It is, however, only recently that the manufacture of brushes has received an impetus in India. A few indigenous brush manufacturing units have sprung up here and there, but the industry as such has not grown up on a big commercial scale. These units utilize mostly the smaller lengths of bristles, and though they produce all varieties of brushes, the standard of their workmanship is generally poor. Accurate figures are not available, but it is estimated that organised brushware industry in the country does not normally consume more than 10 per cent of the total bristle production. There would thus

Washing of bristles





being



Window display showing different kinds of brushes

ustry in India

appear to be a big scope for the development of an up-to-date modern brush factory in India.

EXPORTS

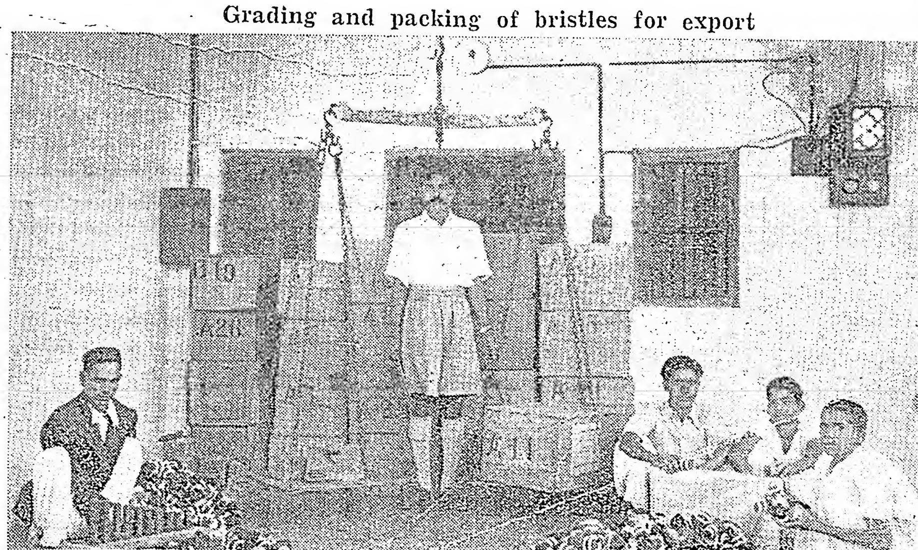
Before world war II, China was the largest supplier of bristles to the world market, followed by Russia and India, but now the position is changed because of non-availability of Chinese and Russian bristles. After the United Kingdom, the United States of America now buys most of the world's bristles. In 1951-52 India exported roughly 6,213 cwts. of

(*Contd. on page 30*)

By
L. M. HIRA,
Directorate of Marketing and Inspection, Ministry of Food and Agriculture

Sorti and bundling of bristles

Grading and packing of bristles for export



SOME NEW and NOT

By
B. P. PAL,
Director, I.A.R.I.,
New Delhi

Research worker examines the ears of N. P. 710 in one of the pedigree seed plots

THE so-called Pusa wheats bred at the Indian Agricultural Research Institute when it was at Pusa in Bihar are well known. After that other wheats have been evolved which while maintaining high yield and quality possess a much greater measure of disease resistance. These wheats are known as New Pusa or "N.P." wheats. This article describes four of them. Seed stocks of these wheats are at present limited but they are being multiplied by the States in which they have given the most promising results. Those interested may write for further information to the Division of Botany, Indian Agricultural Research Institute, New Delhi.

N. P. 710

This variety has been bred by crossing N.P. 52 with N.P. 165 and combines the good qualities of these two wheats. N.P. 52 is a well known old variety produced at the Indian Agricultural Research Institute. N.P. 165 is another well known old variety having in its pedigree some valuable attributes of the famous Australian variety, 'federation'.

The chief characters of N.P. 710 are high yield, good quality of grains and adaptability to a wide range of conditions. It has an appreciable degree of tolerance to the rust disease (known as *gerua*). Among the outstanding characters of N.P. 710 is its high resistance to the loose smut disease (known as *kuhi*) which plays such havoc with older varieties like Punjab C. 591, Kanpur 13 and Pusa 4.

The variety, N.P. 710, has shown a surprising degree of adaptability to diverse conditions. It has been tested in comparative yield trials at a large number of places in the wheat growing tracts of India and has given promising results in the States of Uttar Pradesh, Madhya Bharat, Delhi and parts of Rajasthan, Hyderabad, Gujarat, Saurashtra, Bihar and West Bengal. This variety does particularly well under irrigation, the yields obtained at Delhi and in its vicinity being 35 maunds or more per acre.

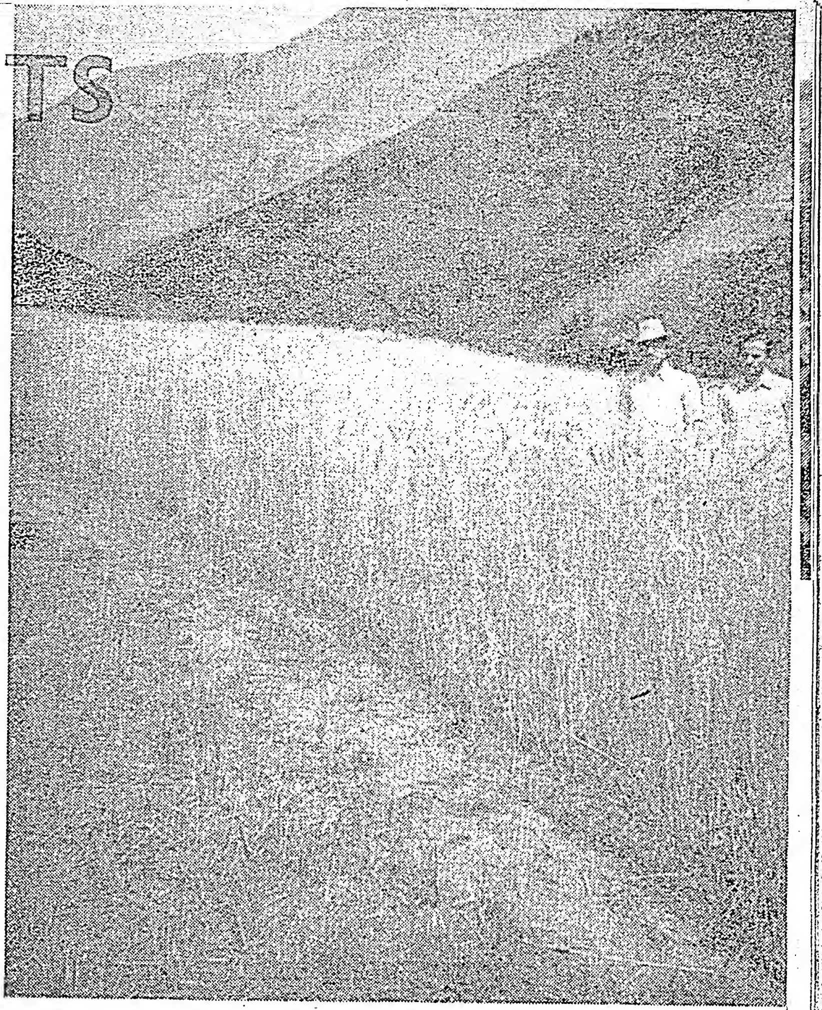
N. P. 718

The pedigree of this variety is the same as that of N.P. 710. There are several outstanding characters which are common for these two varieties. This wheat is fairly resistant to the yellow and brown rusts and highly resistant to loose smut, the latter character thus giving it a decided advantage over the old varieties which are highly susceptible to loose smut. Like N.P. 710, it also shows a considerable degree of tolerance to black rust. In maturity, how-

ever, it is a little earlier than N.P. 710. To the farmers in and around Delhi, it is a variety which 'saves one irrigation' and the cost thereof, because of its early maturity. It has got a fairly strong straw so that it does not easily lodge even under conditions of irrigation. The results of yield trials in which this variety was included have clearly shown that it is a highly outstanding wheat for Rajasthan, Ajmer and Madhya Bharat. It also deserves further trial in some parts of the Punjab, Bihar and West Bengal. It has rapidly become a favourite wheat with the farmers of some villages in Delhi where it was introduced only two years ago and the heavy demand for the seed of this variety is grown still heavier.

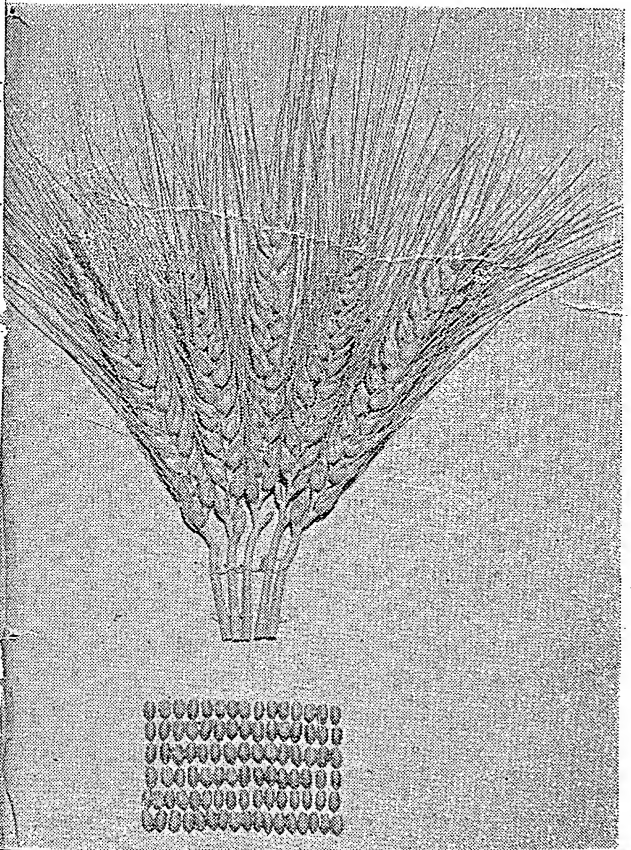
N. P. 761

This variety also has been bred by crossing N.P. 52 and N.P. 165. But while N.P. 710 and N.P. 718 were selected from the material that had been raised at New Delhi, N.P. 761 was the result of selection from the material of the same cross that had been raised at Pusa (Bihar). This variety has shown a moderate degree of resistance to rust attack. It is one of the very early maturing New Pusa wheats and by virtue of this character escapes damage due to black rust, if it is sown at the normal time. During the short period of five years since it has been included in comparative yield trials, N.P. 761 has set up an excellent record in north Bihar. It is also likely to be popular in Orissa where there is a premium on early maturity for wheat cultivation. At the present time, N.P. 761 is being multiplied in north Bihar and Orissa. It has also done well in yield trials in eastern Uttar Pradesh.



Crop of N. P. 770 in the hills of Himachal Pradesh

N. P. 710



N. P. 775

This variety owes its origin to a chance cross that had occurred in nature in the old variety, N.P. 4. Such crosses, as also sudden changes in the genetic constitution of existing varieties occur, though rarely, in nature. The plant breeder takes advantage of these natural phenomena, critically examines the new types thus produced, and if he finds any desirable characters in them, multiplies those plants for further testing and distribution.

N.P. 775 possesses a good degree of tolerance to the rusts, particularly to black rust. Like the old wheats it is, however, susceptible to loose smut. It is fairly early in its maturity, has attractive grains and gives good yields. It has done excellently well in certain parts of Uttar Pradesh and consequently, the Uttar Pradesh Department of Agriculture has included N.P. 775 in the list of recommended varieties for the State. It has been reported to be highly suitable for cultivation in the Tarai region of Uttar Pradesh. The variety has also done well in yield trials in certain areas of the Punjab, south Bihar

(Contd. on page 32)

SELECTION AND MANAGEMENT OF RAMS

By S. JAYARAMAN and B. B. BUCH,

SHEEP industry in India today occupies a very important place amongst the livestock industries and stands second only to the cattle industry. As the producer of a dollar earning commodity the importance of sheep becomes unique. This being the case, the improvement and development of the various breeds of sheep as they exist now require immediate attention. However, the sheep industry is mostly in the hands of illiterate people who are unable to take advantage of the present day knowledge which will help them breed their flocks on scientific lines to their advantage as well as that of the country at large. This problem can easily be solved if promiscuous breeding amongst the village flocks is put an end to. The importance of the sire had been realised long before the principles of scientific breeding and inheritance were made known. "The sire is half the herd" is an old saying. The ram occupies a position of great importance since in a comparatively short time it can make or mar the whole flock. Great care, therefore, is necessary in the selection and management of rams.

SELECTION OF RAMS

At the outset, the beginner in sheep breeding is confronted with the problem of the choice of a suitable breed of ram. It should be borne in mind that only that breed should be chosen, which can thrive under the local conditions in the areas where it is proposed to be utilized. If wool production is the aim of the breeder, he has naturally to select from woolly types while the choice is to be made from mutton types of sheep if meat production is in view.

Whatever the breed, it is always desirable to obtain rams from a known pedigree stud. In case this is not possible, rams may be obtained from any known well-bred flock in the area. It is false economy to go in for a ram without good parentage just because it is cheaper than one with known and good parentage.

The constitution and vigour of a ram need sufficient emphasis. A good ram must have a strong and vigorous constitution and a muscular body. The legs should be short with good bone and feet. The chest must be broad and deep. The brisket (region below the neck between the forelimbs) must be wide and fleshy. The loins must be broad, and the quarters thick and full. There should be a pronounced thickness of firm flesh. Above all, the ram should look masculine which is indicated by a strong head and a heavy neck.

The sex organs should be well developed. It is always preferable to get the semen examined for fertility. The ram may also be put to test service by getting an ewe in heat, since not all rams apparently in good condition, are necessarily good at stud. Rams of woolly breeds should, in addition, have a dense fleece of good quality characteristic of the breed.

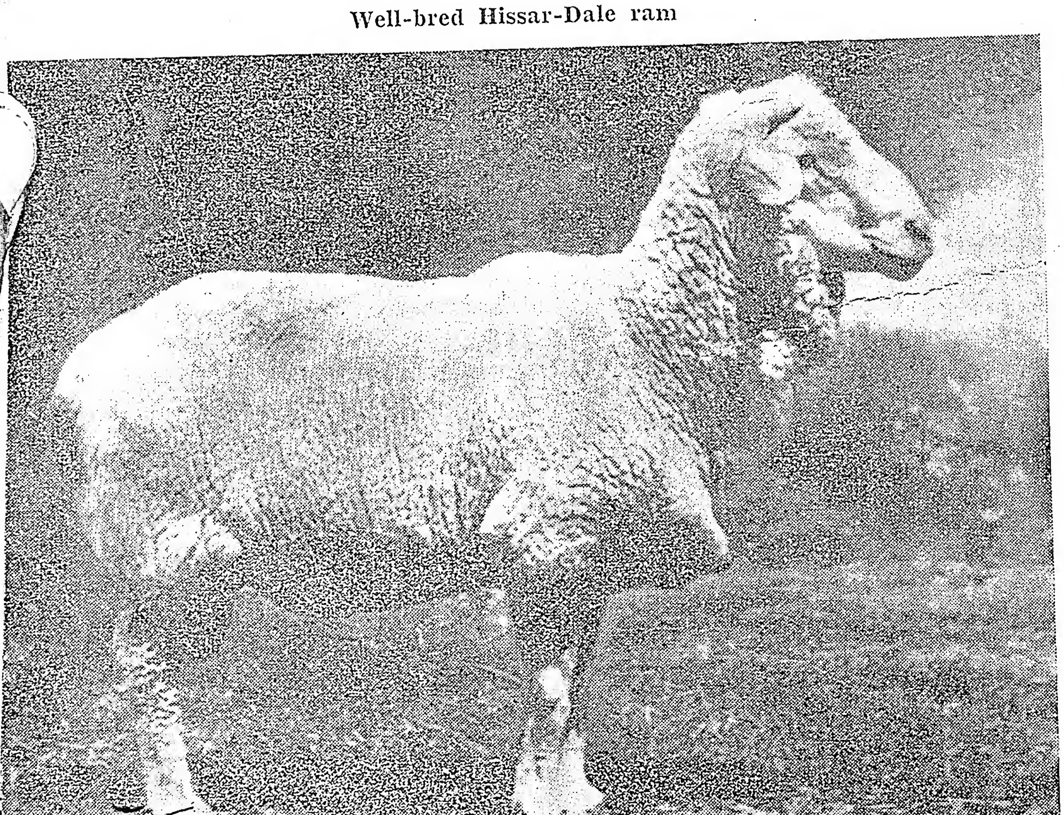
Rams with mouth defects in the form of overshot jaws (popularly known as 'parrot-mouthed' where the upper lip protrudes beyond the lower) or undershot jaws (lower lip protruding beyond the upper), with weak legs, poor constitution or with only one testicle must be avoided.

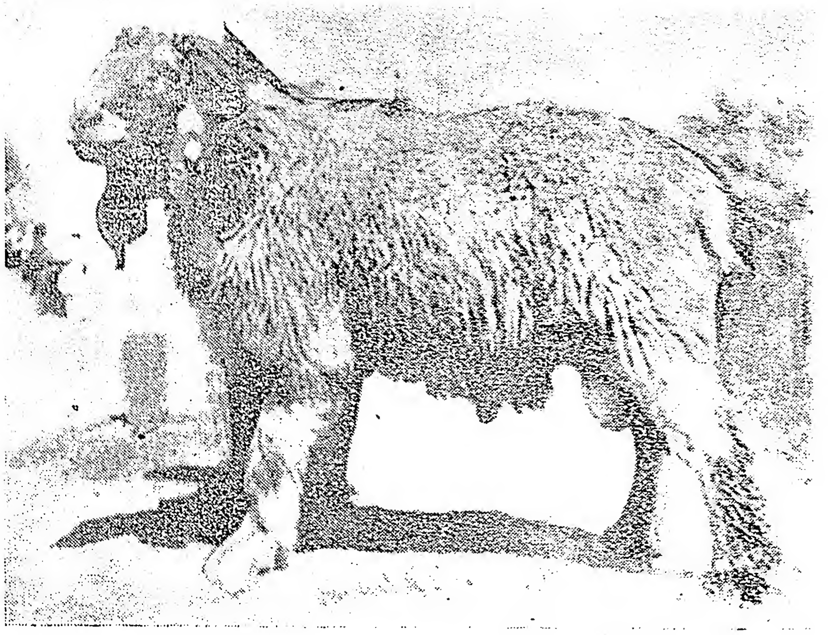
MANAGEMENT OF RAMS

Much of the success or failure of the farmer's enterprise is attributable to the management of rams. In most cases non-serving rams are the consequence of improper management. The feeding, method of breeding and general management, therefore, deserve particular attention.

Breeding: The prevailing practice in the villages is to let the rams remain with the ewes day and night throughout the year. This is an abominable practice and contributes in no small measure to the infertility and consequent decrease in lamb crop. Even the smaller number of lambs dropped is weak and poor in constitution. This ultimately lowers the productive value of the flock. The mating should be fixed for a particular season depending upon the period during which lambs are desired to be dropped. Even during the mating season so fixed, rams should not be allowed to remain with the ewes day and night. By remaining with the ewes all through, the rams indulge in excessive services during the whole of the heat period in ewes. This weakens the rams and eventually lowers the quality of semen. Besides, the rams might even develop a temporary lack of interest for the ewes which in turn will be reflected in the low per-

Well-bred Hissar-Dale ram





Typical Lohi ram

centage of lamb crop. Further, the rams will tease the ewes during daytime thus interfering with their proper grazing. It is always desirable to allow the rams to remain with the ewes only during night and separating them during day. This procedure allows a period of rest for the rams and also allows the ewes to graze properly without interference.

As far as possible the flock should be divided into several groups of 40 to 50 ewes each, with one ram to head each group. This will not only enable the breeder to maintain proper records but will also help in spotting out the ram's defects, if any, and the ram may thus be culled early before its undesirable characteristics are transmitted to a larger number of ewes. Another point in favour of this practice is that the fighting amongst the rams is avoided. Rams are liable to fight amongst themselves and waste most of their time and energy when two or more of them are put in the same pen. Rams are able to serve females at the age of eight to nine months but they should be allowed to mate only from the age of 15 to 18 months. Young rams should never be allowed to serve more than 40 ewes during the breeding season while rams of four to six years of age may be allowed up to 50 ewes. Ram lambs in the flock must be castrated soon after they are weaned in order to avoid indiscriminate breeding.

When rams are given a change of place, it is a sound practice to allow them to rest and to become acclimatized to their new environment before being put to service.

Feeding: The feeding of rams is no less important in the success of the enterprise. Good feed is the foundation for proper growth and upkeep of body tissues besides being the main factor that is responsible for the production of enough number of viable spermatozoa.

Rams must always be given one pound of concentrates daily in addition to good grazing throughout the year. The following grain ration as used on the Government Livestock Farm, Hissar, may be adopted:

Summer:

Crushed gram	2 parts
Wheat bran	1 part
Salt	1 per cent

Winter:

Crushed guar seed	2 parts
Wheat bran	1 part
Salt	1 per cent

The average-sized ram may be given half to one pound of the grain mixture according to the existing grazing conditions. If grazing is in plenty, half pound will be sufficient while one pound of grain mixture with two to four pounds green fodder will be needed during periods of scanty grazing. Sterilised bone-meal at the rate of one-fourth of an ounce per ram may be added to the grain mixture with advantage. An alternative concentrate mixture is:

Groundnut cake	4 oz.
Rice bran	4 "
Boiled horse gram	8 "
Salt	¼ "
Sterilised bone-meal	¼ "

Special care is necessary for the rams from two months prior to the commencement of the tupping season to bring them in perfect condition. As the breeding season approaches, the grain ration may be gradually increased to one and a half pounds daily in stages within about a fortnight's time and this may be reduced to the normal ration after a month of the onset of the mating season. It is good to provide millet seed upto one-fourth the total quantity in the concentrate mixture since it improves the quality and quantity of semen. In short, the management programme should be such that the rams are improving throughout

Bikaneri sheep

the breeding season for this condition is more favourable to the normal functioning of the reproductive system than a satisfactory or falling condition. At the same time rams should not be allowed to become too fat but should be kept in condition through judicious daily exercise, if they are not sent out for grazing.

Control of parasites: Although the nature of the menace of internal and external parasites is not yet fully realised by flock owners, such parasites are mainly responsible for the low condition of rams and the consequent low fertility. Hence periodical dosing for internal parasites (worms) and dipping for external parasites (ticks, lice and mites) must find a place in the farm routine.

Rams may be rid of the worms once in a month with the following mixture which has proved a good preventive at the Government Livestock Farm, Hissar:

Copper sulphate 8 oz.
Powdered mustard 4 „
Water, sufficient to make up three gallons

The solution should be freshly prepared and the ingredients properly dissolved. Two to two and a half ounces of this mixture may be administered to the rams according to their age and size.

External parasites are dealt with by dipping the sheep in a disinfecting solution after four weeks of shearing. McDougall's Sheep dip powder or Cooper's non-arsenical dip has been successfully used in the Government Livestock Farm, Hissar.

Blow-flies are also a common menace and may be avoided by crutching and applying a suitable fly repellent. Crutching, which should be carried out prior to the fly season, is the clipping of hairs from around the tail down to the back of the hocks along the inside of the thighs.

The rams should not be used for service within a period of two months of their recovering from illnesses such as blow-fly strike, foot rot or any fever that might have lowered their fertility.

Rams should neither be grazed nor driven long distances during the hottest part of the day; they should be folded in a cool and shady place during the hot period of the day to avoid their fertility being affected. They should only be grazed in paddocks with plenty of nutritious green feed, adequate shade and good water.

Ample exercise should be encouraged to maintain proper appetite and condition. Rams receiving adequate amount of exercise will produce, on an average, larger ejaculates containing more sperms of better quality. They will also be more active and will render more services in a given interval of time.

All dirty pieces of hair and wool around the prepuce should be clipped a week before the start of the breeding season. In the case of young rams put for service for the first time, it is well to watch them at stud for a week in order to see whether they carry on service properly. The semen of such young rams may also be got examined, before putting them with the ewes.

The overgrowth of hoofs in rams must be pared off and the feet prepared properly before the breeding season.

The attention paid to these details in the management programme will certainly bring ample returns to the farmers in the form of more and better lambs.

POTATO DISEASES AND THEIR CONTROL - - - (*Contd. from page 14*)

per acre towards the cost of the spraying. Bordeaux mixture (copper sulphate and lime solution) and Diathane-D-14 were also found to be equally effective for controlling the disease.

As the tubers are also attacked by spores from blighted tops, it will be useful to give a good earthing up to the plants so as not to expose the tubers, and to harvest the tubers after removing the haulms or after they have completely dried up.

Cercospora leaf spot and stem canker: This disease is caused by a species of *Cercospora*. In the plains, particularly in Bihar, the disease symptoms appear in the field during the second half of December as brown spots which later enlarge with a whitish centre. At first the spots are seen only in the lower maturing leaves but gradually appear also in the young leaves. The chief damage incited by this fungus is to the stem where small linear brown cankers appear which gradually coalesce and cause the falling apart of the stems. The plants affected by *Cercospora sp.* show premature dying resembling plants at maturity. It is, however, noticed that some varieties are more susceptible than others to this disease.

Control measures: Spraying with fungicide such as Diathane, Perenox or Bordeaux mixture once or twice during the growth of the crop, has given a fair amount of control over the disease.

Cercospora concors (Casp.) Sacc. was found to produce violet mildewy growth on the ventral leaf surface inciting the peeling and early defoliation of the leaves at Bhowali, Simla and Kufri areas. This disease, however, was not very severe.

WILT DISEASES

Bacterial wilt and brown rot: This disease caused by a bacterium, *Pseudomanas solanacearum* E.F.S., is of great importance in the hill areas of Nilgiris and Kumaun. In the latter area severe epiphytotics of this disease occur almost every year causing considerable damage to the crop. In the plains, the disease is brought along with the tubers obtained from the hills for late planting (*katwa* planting). The disease incidence in the winter crop grown in the plains depends on the percentage of infected tubers in the seed. In the plains of West Bengal this disease is said to be fairly severe. In Patna City which is an important seed-growing area in Bihar, two to five per cent of the plants in the *katwa* crop was noticed to be affected with bacterial wilt and brown rot every year. The occurrence of this disease is also reported from Bombay and Mysore. The disease was observed for the first time in June, 1951, in some of the wilting plants in Simla.

There has been some confusion with regard to the organism causing this disease, viz. *P. solanacearum,* with another bacterium, viz. *Corynebacterium sepedonicum,* (Spieck and Kotth.) which

causes bacterial wilt and ring rot. The latter disease is known in western countries. A fairly wide survey and detailed study have revealed that the ring-rot bacterium is not, so far, encountered in India.

The first symptom of the disease is the loss of turgidity of the top leaves which show a wilting during the hottest parts of the day. Affected parts, however, recover during the night but the wilting becomes more pronounced as the disease progresses until finally the entire plant wilts away and dies. The vascular bundles in the stems, roots and stolons turn brown and the brown colour is finally noticed on the outer surface of these parts. When the vascular bundles of the affected parts are cut, the bacteria ooze from them as a white slimy mass. Wilting usually starts when the tubers are being formed and if tubers from affected plants are cut and examined, there is usually a discoloured ring in the region of the vascular bundles. Plants with their tops killed by brown rot may, however, bear healthy as well as diseased tubers and sometimes plants showing no sign of the disease in their tops may produce diseased tubers. The affected tubers left in the ground continue to decay. There is also a considerable loss of affected tubers in storage, which is accentuated by other invading, rot-causing organisms.

Control measures: The disease is carried by the tubers and the disease-causing organism is also able to infect the plants from the soil. Besides, there are also other host plants for this organism, from which infection may spread. One way to avoid the disease is to plant cut tubers, wherever possible, after making sure that they are free from disease. Clean cultivation with no weeds in the field will also help in keeping down the disease. As regards soil infection, while it is possible that it may be a factor in the hills, it is not likely to be so in the plains where the summer temperatures are very high. Experiments are under way in the Potato Multiplication Substation, Bhowali, in the Kumaun hills, for controlling the disease by suitable soil amendments.

The main source for the spread of infection of bacterial wilt and brown rot is the cutting implement used for cutting potatoes, wherever cut potatoes are planted as in the case of the second crop in the plains and the main crop in the hills: the cutting implement, if used to cut a healthy tuber, after cutting a diseased tuber, will infect the former. In foreign countries the cutting implement is disinfected by dipping it in mercuric chloride, 1 : 500 solution. Experiments carried out at the Central Potato Research Institute have shown that denatured spirit can be used with the same effect as mercuric chloride solution for disinfecting the cutting implement. The use of denatured spirit can be preferred because it is easily available and harmless.

Black scurf: This disease also called Rhizoctonia canker, is caused by *Rhizoctonia solani* Kuehn. On potatoes, the fungus forms entirely superficial brownish black bodies which closely adhere to the skin: they may be as small as a pin head or larger. These bodies known as sclerotia, are composed of a mass of compact mycelial threads representing the resting stage of the fungus. The sclerotia on the tubers are harmless to the tuber at this stage but give it a bad appearance. However, when affected tubers are planted, the fungus grows out and kills the sprouts. It also attacks the roots, stolons and tubers of the new crop. Cankers occasionally develop on the older plants and the collar portion is girdled. This interferes with the downward movement of the elaborated food material into the root and tubers. As a result, the buds at the base of the plant enlarge to the size of small tubers and give rise to what are known as 'aerial tubers'. The leaves become yellow or reddish-yellow and show a tendency to roll and become crinkled. Many of the affected plants ultimately wilt. When the diseased plants are pulled out the tubers appear clustered on short stolons near the surface of the ground. This disease was found to be fairly widespread on many varieties and hybrids grown at the Institute. It was also found in cultivators' crops. There was, however, considerable variation in the degree of incidence of the disease on the different varieties. The perfect

stage (basidial stage) of the fungus sometimes occurs as white powdery coating on the basal portion of the stem.

Control measures: Tubers free from *Rhizoctonia* infection should be planted or slightly affected tubers may be planted after treating them with a fungicide which kills the fungus but not the tubers. One part of formalin in 120 parts of water is taken and the whole tubers with the sclerotia are dipped in the solution for about $1\frac{1}{2}$ hours. After this the tubers are taken out, dried and planted. In western countries, tubers are treated with mercuric chloride before planting. A solution of one part of mercuric chloride to 1,000 parts of water is generally used. The potato tubers are treated in this solution for 30 minutes to two hours. It should be remembered that mercuric chloride is very poisonous and should be used with very great care. Unused solutions should be buried and treated tubers should be stored separately with no possibility of their being mixed with potatoes for human consumption or for livestock feeding.

Ozonium wilt: This is a new disease recorded for the first time in India. It is caused by a fungus known as *Ozonium texanum* var *parasiticum*. This was noticed to occur in restricted areas in Patna, Simla and Bhowali. In Patna City, about one per cent of the plants in the cultivators' fields was noticed to be affected with the disease; at Niglat in Bhowali, Uttar Pradesh, about three per cent of the plants of the variety, Magestic, was found affected in 1950.

The diseased plants can be recognised in the field by their stunted growth and pale colour. The lower leaves turn yellow first, followed gradually by the loss of turgidity of the haulms and ultimately wilting of the entire plant. When the diseased plants are pulled out and examined near the collar region, the thick strands of hyphae of the fungus developing numerous tiny mustard-like bodies (sclerotia), may be seen. In the soil, all round the plant, the fungus develops white rope-like structures called the rizomorph on which the sclerotial bodies are attached.

Since it is possible that the disease may develop into serious proportions, studies were in progress at the Central Potato Research Institute to develop control measures for it. As the fungus is soil borne, the control measure that can be recommended, at present, consists of pulling out the diseased plants and carefully destroying the portions bearing the fruit bodies and disinfecting the soil round about the plant in order to kill the hyphal strands and sclerotia in the soil. For this purpose the soil may be treated with 1 : 1,000 mercuric chloride solution. This will have, however, to be done with great care as mercuric chloride is a virulent poison.

STORAGE DISEASES

Charcoal rot: This is a major disease of potatoes in the plains of North India. It has been noticed to cause severe losses in stores in the Patna City area. The extent of loss due to this disease may be upto 50 per cent or more.

The disease is incited by *Macrophomina phaseoli* (Mabl.) Ashby, a soil inhabiting fungus which makes rapid growth under warm weather conditions. The tubers get infected in the field during the growing season but the disease symptoms appear during storage. The diseased tubers show black patches at first and gradually the discolouration spreads to the whole tuber. The eyes are killed and in due course the tuber becomes converted into a black, foul-smelling mass. Usually the charcoal rot affected tubers are found associated with a bacterium known as *Bacillus polymixa* which enhances the rate of decay of the tubers in storage; the tubers in such cases become soft and pulpy and exude an amber-coloured frothy mass.

Control measures: As a result of studies carried out at the Central Potato Research Institute, it was noticed that the extent of infection in the field was mainly related to the time of harvest of the tubers. Experiments carried out during 1950-51 showed that while tubers harvested by about the end of February showed a rottage of about 10 per cent in the stores, those harvested progressively later showed correspondingly increased losses in stores; those harvested by the end of April showed the highest percentage of loss amount-

ing to as much as 60 per cent and more; in later harvest the tubers showed more severe infection and rottage in the field itself. Since the activity of the fungus is favoured by warm weather conditions it is recommended that the tubers should be harvested when the weather conditions are comparatively cool. In Bihar, it has been found that harvesting before the beginning of March considerably reduces the loss due to this organism. It was also noticed that harvesting the crop at about this time does not affect the yield as the tubers do not increase in size very much after this time.

Studies on the relative resistance of varieties to this organism were also undertaken both by field experiments and by inoculation tests using a large number of varieties and species. While a majority of the material was found to be susceptible to the disease to varying degrees, a few varieties including certain clones of *Solanum chacoense,* a species obtained from South America, have been found to be resistant or immune to the fungus. These are being made use of for breeding resistant commercial varieties.

Other storage diseases : *Bacillus polymixa,* a bacterium, as already mentioned, was usually associated with charcoal rot fungus and found to hasten rotting of potatoes in stores; the affected tubers become soft and pulpy. *Pythium ultimum* was also noticed to cause the leak disease of potato in the late harvested potatoes in stores. Both these organisms are wound parasites. In cases where these diseases are prevalent, the rotting tubers should be removed and the rest of the tubers treated with 1 : 120 formalin and dried in the sun before storage.

Another storage disease which was noticed to be of not major importance is the dry rot. This disease is incited by the fungus *Fusarium coeruleum* (Lib.) Sacc. The infection starts at one end of the tuber, first appearing as a depression. In due course the entire tuber or only a portion becomes converted into a hard wrinkled mass. On the diseased portions small white button-shaped bodies are produced which on cutting appear pale blue inside. The spores of the fungus are produced on these bodies. Since the fungus spores are carried from one tuber to another in the store, sanitary method of storage is essential. This consists of disinfecting the godowns and the containers (baskets, etc.) with 1 : 120 formalin solution before storage. The tubers are also treated with the same solution before storage.

TUBER DISEASES

Mention may be made here of two diseases which cause rough lesions on the tuber surface and disfiguration of the potatoes. They are the common scab caused by *Streptomyces scabies* and the powdery scab caused by *Spongospora subterranea.* These diseases are not, however, very common in India and only sporadic cases of infection have been observed. The common scab was noticed in tubers harvested at the Potato Multiplication Substation, Bhowali, and the powdery scab in tubers received from Himachal Pradesh.

The first sign of infection with *Streptomyces scabies* is the development of small, scattered, irregular spots on the tubers at the lenticels or breathing pores. These spots later increase in size until raised scabs or pustules are produced. In slight attacks, the scabs remain separate but in severe cases they coalesce and cover practically the entire tuber surface with a superficial corky tissue.

The common scab organism is carried from one season to another in the scabby spots on the tuber: it can also infect the tuber from the soil. Common scab is particularly severe in alkaline soils. Seed treatment with fungicides and avoidance of too much alkalinity of the soil are known to check the disease.

The powdery scab somewhat resembles the common scab but the individual spots are nearly circular and smaller. The open pustules are filled with brown powdery mass of spores. The causal organism also lives in the soil and infects the tubers during their growth. Affected tubers should not be used for seed purposes and long rotations are recommended for ridding the soil of infection.

DEGENERATION DISEASES (VIRUS DISEASES)

This is a group of diseases which causes the degeneration of potato varieties. The diseases are caused by ultra-microscopic bodies which are carried by the seed tuber from generation to generation. It is not possible to detect the presence of these bodies in the seed tuber. The only way to detect them is by the disease symptoms which they produce on the growing plant. Although there are a number of virus diseases affecting potatoes, only a few are of practical importance in our country. They may be broadly classified as 'mosaic' and 'leaf roll'. The former are caused by viruses designated as 'X', 'Y' and 'A' and the latter by the 'leaf roll' virus. Virus 'X' itself produces mild symptoms on the plants, such as a faint mottling of leaves (interlocking light and dark green areas on the surface) together with occasional crinkling of margins. This disease is fairly widespread in all the potato varieties. It, however, incites severe symptoms in combination with other viruses such as 'A' and 'Y'. With virus 'Y' it produces 'rugose mosaic' and with 'A' severe 'crinkle'. The plants affected with rugose mosaic are normally stunted with the leaves markedly corrugated between the veins; the leaves are also distorted with downward curly margins. Plants affected with 'crinkle' show conspicuous blotchy mottling of leaves which are also very much crinkled. Viruses 'Y' and 'A', although distinct entities, are closely similar. Virus 'Y' is more important and causes from mild to severe mosaic depending on the variety. It also causes what is known as leaf drop streak as a current year's infection. In this case, the infection starts as short dark streaks on the veins on the under-side of the leaves; these streaks spread and ultimately kill the whole leaf which then hangs down attached to the plant. By itself virus 'A' is not very important but incites severe symptoms, as already pointed out, in combination with virus 'X'. The plants affected with leaf roll have generally a stiff, erect or staring habit; their leaves are thickened and rolled upwards unlike normal plants which have flat and flexible leaves. The leaf roll affected plants are generally dwarfed and produce a rattling sound when shaken thereby showing the brittle nature of the leaves.

The above diseases are fairly widespread in all our varieties and they are spread from diseased to healthy plants in the field by means of insect vectors, known as aphids; the green fly, *Myzus persicae*, which belongs to this group, is the principal vector. Virus 'X', however, is known to be transmitted in the field by contact of diseased and healthy potato foliage; it is not known to be transmitted by insects.

Virus affected plants are known to give considerably reduced yields. The reduction in yield resulting from infection with leaf roll and severe mosaic is very much more than with the mild mosaic caused by virus 'X'. In the former case, the reduction in yield may be as much as 90 per cent depending on the variety and the severity of the infection. Since the infection spreads in the field from diseased to healthy plants rapidly by means of insect vectors, the crop may degenerate in a few years, if steps are not taken to prevent the spread of this disease in the field. Actually the seeds used by most of our cultivators are heavily infected with the result that the yields are very low.

Control measures: Since it is not possible to cure virus diseased potato plants, it is necessary to undertake measures to avoid these diseases by means of preventive measures. The preventive measures consist of the following:

(1) The initial seed used must be free from virus diseases.

(2) Subsequent seed must be multiplied under conditions of disease-freedom so as to avoid the progressive accumulation of these diseases in the seed stock. The seed plots for this purpose must be situated in an isolated spot, far away from other potato crops which may carry infection. These plots should not have grown potatoes in the previous year so as to avoid 'ground keepers' (left over potatoes of the previous year) which may act as sources of infection. The plants, when they are about 6-9 ins. high, should be examined and all those showing severe symptoms of virus diseases should be pulled out and burnt. It is important that this 'roguing' should be done early when the plants are small as it will be easy to remove them at this stage and as they will not have formed any tubers which if left inside the ground will again act as sources of infection.

(3) It will be better to locate the seed plots in areas where there is less or no incidence of aphids. Such places are available at high elevations in the hills. However, fairly disease-free stocks could also be raised in the plains if the seed plots are located in an isolated place and rigorous roguing of the crops is done to eliminate all infected plants, for it is only the combination of insect vectors and infected plants that can spread the disease. The absence of one or the other will not spread the disease.

In all foreign countries, seed certification organizations are functioning which undertake to inspect the growing crops and issue certificates of freedom from disease for the seed. Certified seed has better cropping capacity and gives greater returns than the uncertified seed. In our own country, the cultivators are becoming more and more virus-conscious and the State Departments are paying attention to seed certification and supply of disease-free seed to cultivators.

(Contd. on page 28)

Inactivation of leaf roll virus: Our observations at the Central Potato Research Institute, Patna, during the past two years showed that the incidence of leaf roll in crops raised from seed stored in the ordinary stores from March-April to September-October, showed very much less or practically no incidence of leaf roll compared to those raised from seed stored in the cold store for the same period. This was presumably due to the inactivation of the leaf roll virus in infected tubers stored in the ordinary stores by the high temperatures that prevail during summer. With a view to confirming this presumption, experiments were conducted during 1952-53. Tubers from a number of individual plants severely infected with leaf roll were harvested separately in March, 1952, and half the produce from each plant was stored in the cold store and the other half in the ordinary store in the laboratory. The tubers from the two lots, viz. one lot stored in the cold store and the other in the ordinary store, were planted side by side during October, 1952. The seed from 36 plants was planted in the above manner. It was noticed that while all the plants emerging from the tubers stored in the cold store, showed severe infection with leaf roll virus, those arising from the tubers stored in the ordinary store were apparently very healthy; the yield from the affected plants averaged 4.5 oz. per plant while that from the healthy plants was 8.9 oz. per plant. This finding offers the possibility of devising measures for inactivating the leaf roll virus in seed potatoes by suitable thermal treatment. Investigation on this aspect is receiving attention at the Institute.

DISEASES DUE TO NON-PARASITIC CAUSES

In this group of diseases are included those that seem to be due to unfavourable weather conditions or other causes and are not known to be caused by any virus, fungus, bacterium or insect.

Internal brown spot: This disease is characterised by irregular or concentric dry brown spots scattered through the flesh of the potato. These spots consist of a group of dead cells free from bacteria and fungi. This disease was noticed in tubers of Darjeeling Red Round grown at Netarhat in Bihar and in those of Up-to-date grown in Himachal Pradesh. The presence of such spots in the tuber reduces the quality of the product. Not much is known about the cause of this trouble but it is believed that it may be caused by unfavourable weather conditions leading to continuous drought during tuber formation followed by flooding late in the growing season or due to lack of certain minor elements in the soil. Preliminary studies have indicated that the former is a likely cause for the production of affected tubers.

Mechanical injuries: In certain fields which were badly infested with weeds, tubers with canker-like depressions on the surface were obtained. These result from the stolons and leaves of grasses and *Cyperus* penetrating right across the flesh of the tuber. Apart from the reduced commercial value of these tubers the wounding predisposes them to infection by rot-causing fungi. To avoid such tubers from being formed, the fields should be kept free from weeds, particularly grasses.

PREPARATION OF FUNGICIDES

Bordeaux mixture: The ingredients required for 100 gallons of the mixture which would be enough for spraying approximately one acre, are as follows:

10 lb. copper sulphate (blue stone)
10 lb. quick lime
100 gallons water

The requisite quantity of copper sulphate crystals is at first dissolved in sufficient quantity of water. As copper sulphate goes into solution rather slowly it will be useful to suspend the crystals in a sack or a coarse cloth bag in water contained in a wooden cask. If left to stand overnight, all the crystals will have dissolved and after stirring the solution, it should be made upto 90 gallons by adding the necessary quantity of water. Ten pounds of quick lime are slaked in a small quantity of water in another vessel and the solution is made upto 10 gallons by the addition of water. The two solutions are mixed together and stirred vigorously. The resulting mixture (Bordeaux mixture) has a milky blue colour and is ready for use. So long as the solutions are not mixed they will keep indefinitely but once mixed, the mixture should be used within 24 hours as otherwise it tends to form precipitates on standing and becomes worthless. If, however, it is found necessary to store the mixture overnight, two pounds of *gur* may be added to 100 gallons of the mixture.

As acid copper corrodes metallic vessels, wooden or earthen vessels should be used for making the copper sulphate solution; if metallic vessels are alone available, they should be well-coated with asphalt or painted with white lead. Free copper in the mixture may cause severe scorching of the potato leaves, and if it is present in the mixture it should be corrected by the addition of more hydrated lime. It has been found that the addition of 5 oz. of linseed oil to every 50 gallons of the mixture acts as a good spreader; the linseed oil should, however, be thoroughly mixed with the solution to form an emulsion.

Perenox: This is a proprietary product of the Imperial Chemical Industries, England. It is in the form of a brownish powder. The ingredients for 100 gallons of the spray mixture are as follows:

3½ lb. Perenox (powder)
100 gallons water.

The requisite quantity of Perenox is dissolved in 100 gallons of water and the solution is ready for use. In places where, after spraying, the mixture is likely to be washed off by rains, it is useful to add a sticker to the solution. Rosin-soda emulsion acts as a sticker and spreader. The following are the ingredients if the sticker is to be included in the mixture.

3½ lb. Perenox (powder)
2 lb. Rosin
1 lb. Soda ash
100 gallons water

It is necessary to secure a thorough emulsion of rosin in soda. This can be accomplished by adding the soda ash in one gallon of water and boiling the solution; to this boiling solution is added powdered rosin keeping the solution vigorously stirred for about 10-20 minutes so as to obtain a uniform and viscid emulsion. The

(Contd. on page 30)

BRISTLE INDUSTRY IN INDIA - (Contd. from page 17)

bristles valued at Rs. 60,35,485. Roughly over two-thirds of our bristle exports go to the United Kingdom, while a substantial portion of the balance exports finds its way to United States of America. The trend of demand from the United States of America is generally on the increase and there would appear to be a very good possibility of extending the market for bristles in that country as also in several other continental (European) countries.

PRICES

Bristle is an expensive commodity and its price is governed largely by the operations of the London Bristle Auctions which are normally held at three months' interval. Any rise in world prices has its natural effect both on internal and export prices. Likewise, fluctuations in the demand of a particular quality also exert their influence on bristle prices. As a rule, however, price varies with size—the bigger the length, the higher the value. Longer bristles, four and a half inches and more, are preferred by the trade because these can easily be cut into pieces of the desired size.

Roughly speaking, before the world war II, raw bristles, comprising all lengths were sold at an average price of Rs. 5 per lb. During the first two years of the war, the prices showed an upward tendency and varied between Rs. 7 and Rs. 10 per lb. In the immediate post-war period, the prices remained between Rs. 10 and Rs. 15 per lb. Since then, bristle prices have tended to go up. The current prices of raw bristles are the highest in the history of the bristle trade and range from Rs. 20 to Rs. 25 or even more per pound.

It is likely that buyers of bristles from India in the United Kingdom may be encouraged. The price level as a result may deteriorate in the United Kingdom. The danger of flooding the market by reckless and indiscriminate shipments should, therefore, be guarded against.

Another factor which may adversely affect the volume of our exports is the prevalence of high prices in India. The prices of bristles being high, substitutes like 'nylon', etc. are used in the United Kingdom and the United States of America in increasing quantities in the manufacture of brushes, particularly toilet brushes.

MARKETING OF BRISTLES

Till quite recently, the village producer and the itinerant merchant usually sold their bristles in raw state, but of late, they have taken to offer bristles in the 'dressed' condition. The dressing consists in washing and drying and sorting bristles according to colour and length. Bristles of particular lengths are bound together in bundles of roughly about four ounces. Kanpur and Jabalpur are the biggest trade centres for dressed bristles; Bombay is the main shipping port.

SUGGESTIONS FOR IMPROVEMENT

Standardization of the grades for export is an essential pre-requisite towards the efficient marketing of this commodity. There is also no planned collection of bristles in India. The prices paid to the collectors by village merchants are very low and there are at present too many middlemen in the bristle trade. This deprives the producers of a substantial share in the value of this product. A good deal in this connection could, therefore, be achieved by organizing collectors on a cooperative basis in such areas and organizing easy marketing facilities. By more intensive collection, the quantity of bristles available for internal consumption and export could be greatly increased and besides, this would provide a good source of subsidiary income to the rural population.

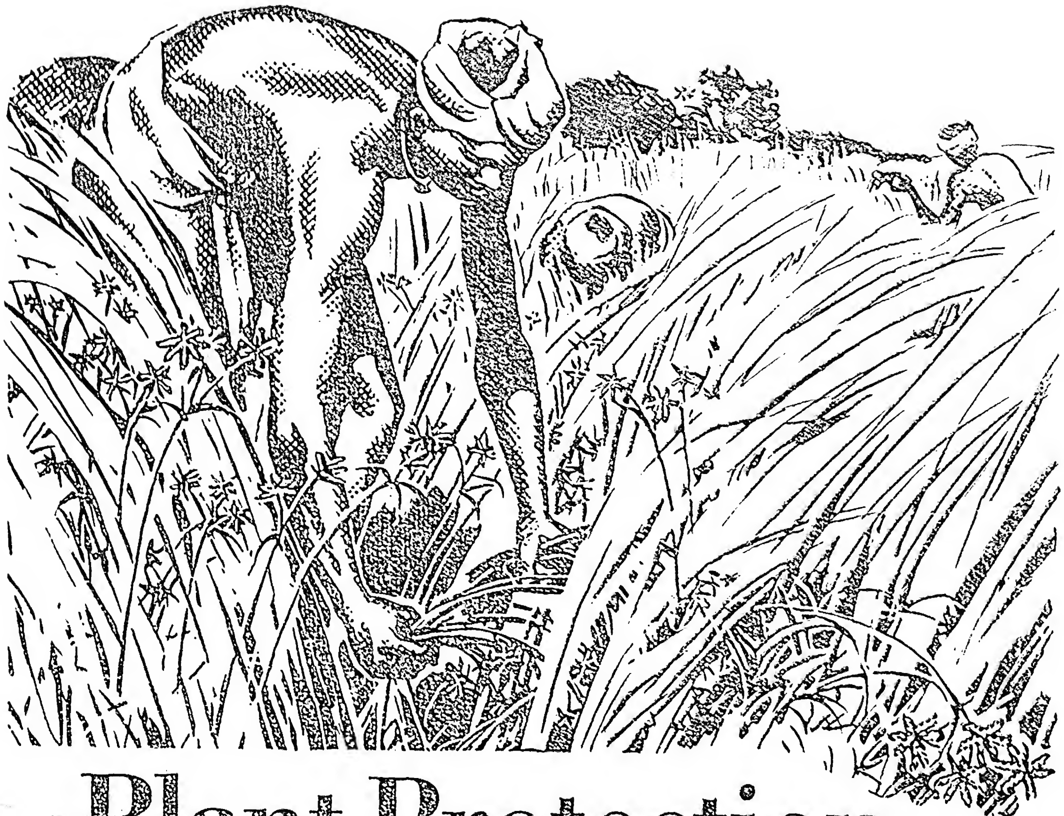
Photographs by courtesy the Directorate of Marketing and Inspection, Ministry of Food and Agriculture

POTATO DISEASES AND THEIR CONTROL (Contd. from page 28)

rosin-soda emulsion is then added to the Perenox solution and stirred. The mixture is now ready for use.

Diathane-D-14: It is a proprietary product of Rhom and Haas, U.S.A., and is in the form of a liquid. The following ingredients make up 100 gallons of the spray mixture:

2 Quarts Diathane-D-14
1 lb. Zinc sulphate
¼ lb. Lime
100 gallons water



SOME NEW AND NOTEWORTHY WHEATS

(*Contd. from page 19*)

and Madhya Pradesh. Due to its good performance and superior grain quality, N.P. 775 is one of the most favoured wheats for the farmers in and around Delhi. In tests conducted at the Indian Agricultural Research Institute, to assess the *chapati*-making qualities of a number of wheat varieties N.P. 775 was found to be one of the very best in characters like appearance, sweetness, etc. of the *chapaties*.

N. P. 770

This variety was derived from a cross between a Japanese variety of wheat, "Kononso" and N.P. 4. Both the parents in this cross are early in their maturity but, interestingly enough, N.P. 770 is a late maturing wheat. A distinctive feature of this variety is that the plant grows tall and has a very attractive appearance. The grains too are very bold and attractive. This variety is also noted for its high degree of resistance to loose smut. It is partially resistant to the rusts, particularly to the yellow rust. It stands well in the field in spite of its tall straw. N.P. 770 has been found to be very suitable for cultivation in the hills, particularly at higher altitudes. It has acquitted itself excellently in trials in Himachal Pradesh especially when sown a little late in the season, after the middle of October or early in November. *Chapaties* made with the flour of N.P. 770 seeds are reported to be very tasty. In the plains and at lower altitudes it tends to behave as a late variety and is not recommended for such conditions as it may be attacked by black rust.

INDIAN FARMING

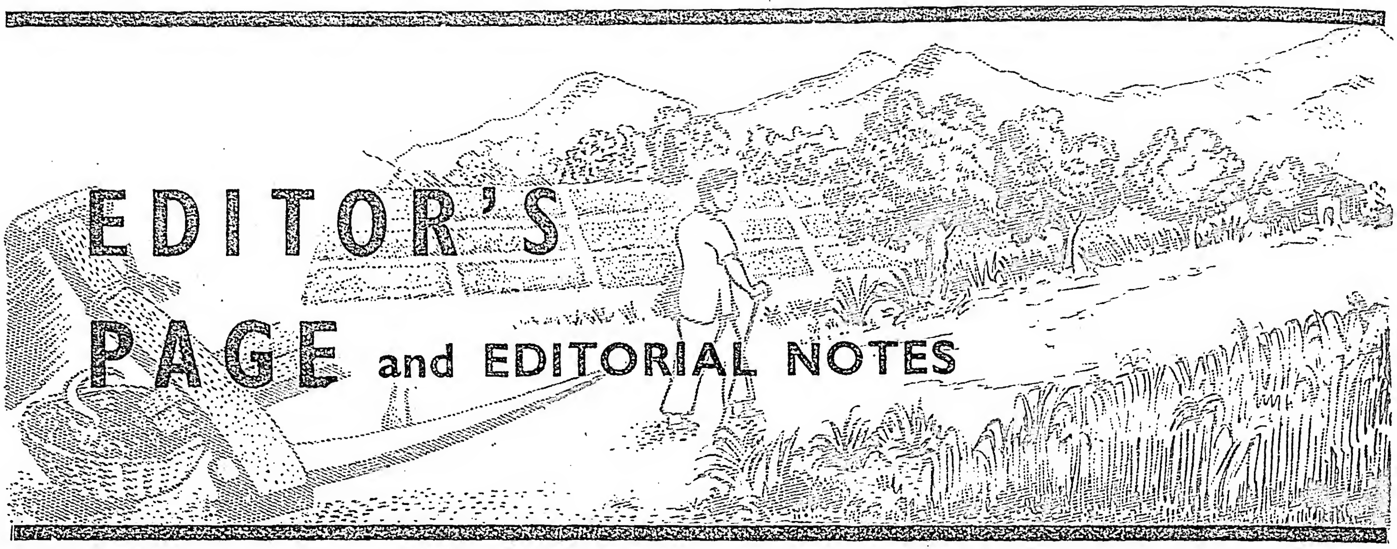
Vol. II New Series No. 7 Oct. 1952

EDITOR'S PAGE AND EDITORIAL NOTES 2
MAN OF THE MONTH (Feature Article)—Neelay R. Ramaiyah .. 4
INSECT PESTS OF STORED GRAINS AND THEIR CONTROL—E. S. Narayanan .. 8
THE RAT 14
30 YEARS OF SELECTIVE CATTLE BREEDING WORK AT CENTRAL DAIRY RESEARCH INSTITUTE—A. R. Vyas .. 16
CLEANING AND CONDITIONING OF FOODGRAINS—S. V. Pingale and R. C. Bhutiani .. 18
POTATOES IN PLENTY—R. D. VERMA 22
LAND AND IRRIGATION—R. V. Tamhane 24

★

EDITORIAL BOARD

Printed and published by P. H. Raman at the Associated Advertisers and Printers Ltd., 505, Arthur Road, Tardeo, Bombay 7. (Agents for Indian Council of Agricultural Research, New Delhi.)



A WEEK THAT MATTERED

The Union Ministry of Agriculture called two very important conferences which were in session for several days ending 28th September 1953. Beginning with a meeting of the State Directors of Agriculture, called primarily to discuss the role of Departments of Agriculture in the National Extension Service, the series of meetings terminated as a conference of the State Ministers of Agriculture and Cooperation held from 24th September. There has been much confusion in the minds of the various Development Departments about their place in the Community Development Projects and the National Extension Service. These two conferences have done much to clarify the place that Departments like Agriculture will occupy in the ambitious development programme launched by the country.

However discussion on the role of Development Departments in the Extension Service was one of the many very important subjects discussed at the Ministers' Conference. Building up of key personnel, arrangements for basic agricultural training, improvements in timeliness and reliability of agricultural statistics, working of state tractor organizations, land reform policies, supplies of pure seeds, manures and fertilisers, and coordination and intensification of work in the field of cooperation, were among some of the most important and controversial subjects dealt with at the conference. The problem of provision of agricultural finances as well as the question of setting up of Farmers Union were also discussed.

The decisions of the conference in the form of recommendations are bound to have far-reaching effects on the working of the various development projects. Not only that but the entire picture of the increased production activities is likely to emerge clearer, thanks to the recommendations taken at this conference. For the first time a full and frank discussion of the land reform policies has indicated to both the Centre as well as the States an idea of the limits to which these policies may go as also the consequences of delay in ensuring uniformity in land reform legislation in the States.

The tempo for the conference was set by the Prime Minister in his inaugural address and the Union Minister for Agriculture in his presidential address. Dr. Deshmukh reviewed the work of the Ministry during the last one year, and also indicated the ideas on which the agricultural policies of the Centre were based. The underlying note of anxiety, all through the speeches as well as through the deliberations of the State Directors and the Ministers, emphasized the need for closer coordination and a dynamic concept of education and field work. The Prime Minister was right in stating that unless you meet the common man on his own ground, nothing much can be done. He was also right in reiterating that mere publicity or printing of literature will not bring the farmers nearer to the workers. What is to be realized by the agricultural authorities is the need for equipping the village level worker with the basic training and supplying practical and useful information to make him conversant with the latest trends in agricultural and other practices. This can be done by making available to him all that is latest in research at the right time. But that is not all. The farmer also has to be served and in approaching the farmer the village level worker should not be expected to rely on the printed word alone. Because of the high percentage of illiteracy in the country, the printed word has a limited appeal. The modern media like the films and the radio also have a much more limited influence because of the inadequacy of the equipment in the country. So the best form of approach to the farmer is going to be through personal contact, popular demonstration, exhibition and other simple media, for which it will

be essential for the State Agricultural Departments to have a Technical Information worker to attend to the needs of the development projects in their particular areas. The State Directors of Agriculture did well to recognize this and the recommendations made by them to implement the programme outlined at the Lucknow Conference and to appoint an Agricultural Information Officer in the Agriculture Departments are a welcome move.

One of the outcomes of the conference was establishment of a closer contact between the Union and the State Ministers of Agriculture and the proposal of Dr. Deshmukh, to obtain quarterly reports from the State Ministers and to address an informal monthly letter to the Ministers, will enable the States and the Centre to maintain constant flow of information on implementation of various projects and recommendations of this conference. For efficient working of any countrywide programme, it is essential that effective liaison be established. This has now been done.

The recommendations of the conference also embraced subjects such as soil conservation, development of inland and marine fisheries, key villages and *gosadans,* agricultural marketing, statistics, etc. Thus care has been taken by the conference secretariat to include all possible aspects of agriculture, animal husbandry, fisheries, etc., in the agenda for discussion. As stated earlier, recommendations having far-reaching effects have been made at this conference and it is to be hoped that the implementation of these recommendations will be effectively done.

It has rightly been asked what is the role of the farmer in all these discussions about his future. This conference has once again decided to take up the question of organizing Farmers' Unions. It was more than a year ago at Indore that the then Minister of Agriculture Shri K. M. Munshi, had mooted the idea of setting up a National Farmers' Association. Though the concept of the Farmers' Association in the present recommendation differs from the original proposal, it meets the requirement of those responsible for the working of the Five Year Plan for a non-official agency for making the voice of the farmers heard. Needless to say that such associations are to be non-political in character. At the conference the State Ministers undertook to explore the possibilities of bringing about farmers' association in their States in the light of local conditions. A suggestion was also made that as soon as the relevant data and available literature have been collected, a sub-committee should be appointed to go into the question in considerable details and make recommendations.

ERRATA

September, 1953 *issue of Indian Farming*

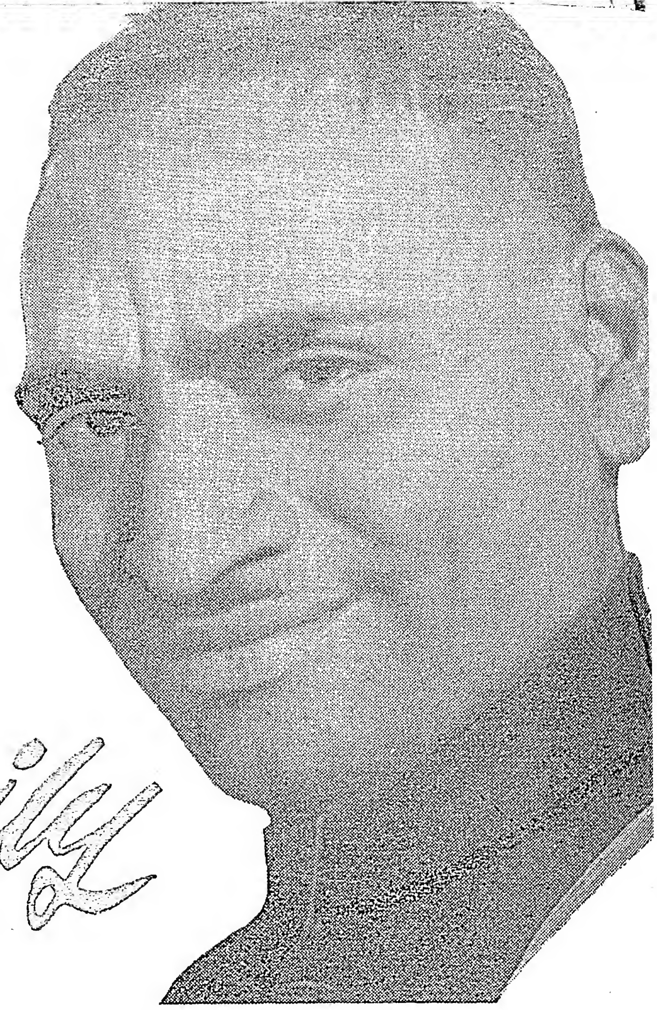
Page 4 —Feature article
"Man of the month".

For S. R. Sabhlok (Author of the article).

Read Padam Singh Jhinna.

MAN OF THE MONTH:

How Improved Agriculture Brought Lost Fortune to a Family



Shri Keshao Kashinath Yerawar Ghatanikar

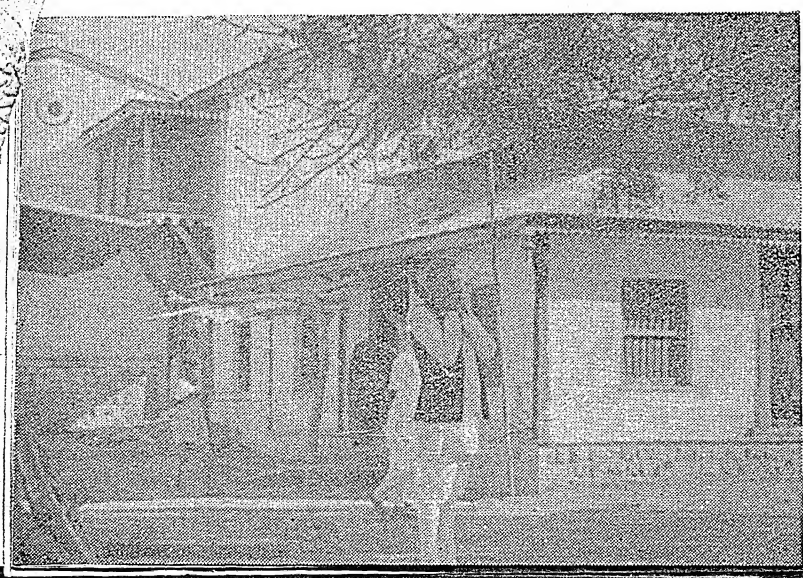
By NEELAY R. RAMAIYAH

THERE was a time when Ghatna, a village about 17 miles from Yeotmal in Madhya Pradesh, lay almost fallow; today, it presents the spectacle of a progressive colony inhabited by industrious farmers. It is a colony buzzing with activity, where improved technique of agriculture is adopted in striking contrast with the conservative outlook of the cultivators in the surrounding villages. All this has happened due to the efforts of Shri Keshao Kashinath Yerawar, who migrated to this village in 1918, with the sole desire to save his family and himself from penury and hunger.

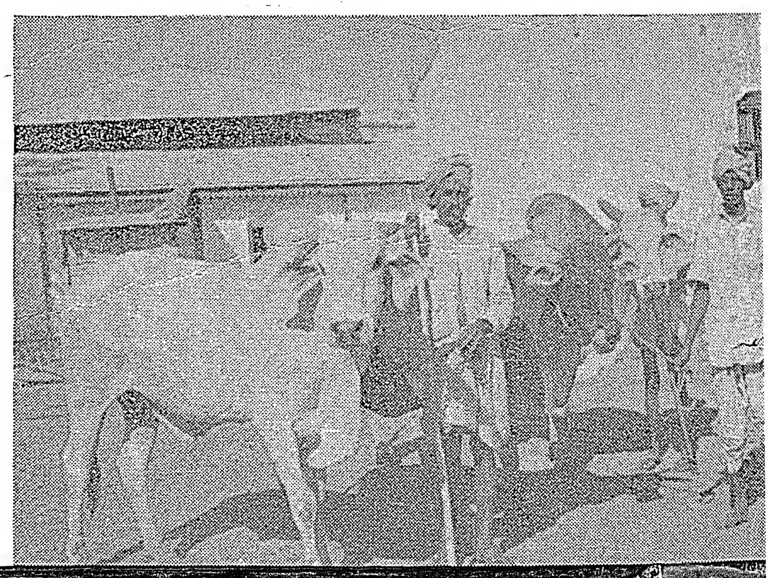
It was the father of Shri Kashinath, Shri Harba Patil, in fact, who first received the *ijara* rights of Ghatna. At that time the Yerawar family was residing in the Kalsapur village in the same district, and possessed only 72 acres of land. The *ijara* rights of Ghatna hardly yielded an income of about Rs. 200 per annum. This meagre income was insufficient to meet the needs of the family, and a debt of Rs. 40,000 was gradually incurred. Determined to liquidate this debt as early as possible, and to bring about a comfortable living, Shri Kashinath decided to take a chance. He packed his few belongings and left for Ghatna in a bullock-cart, with the only capital of about 50 *tolas* of gold in the shape of his wife's ornaments.

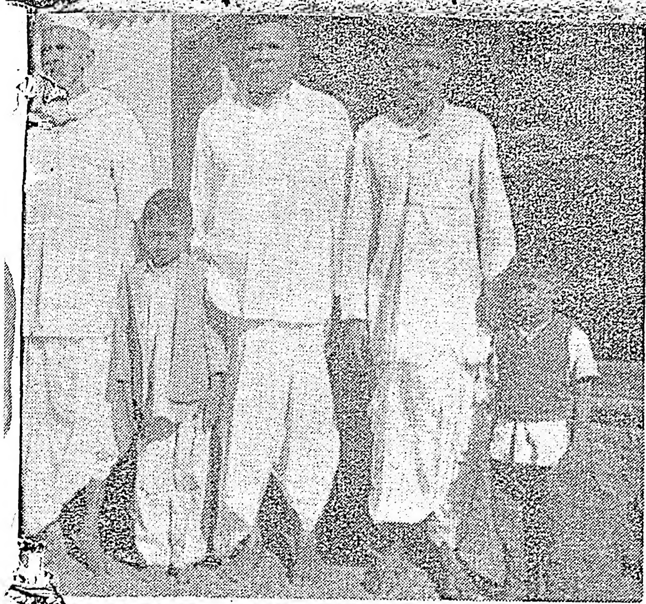
With a great deal of confidence in himself, Shri

The new Farm House at Ghatna

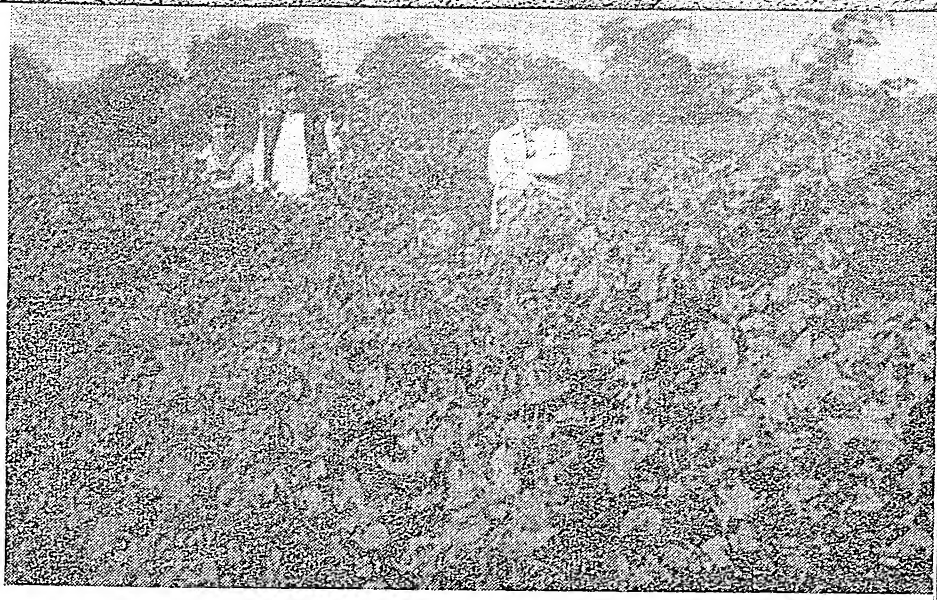


Hariana bulls and a cow





Yerawar Family



Field of Buri 0394

Kashinath set about to complete his arduous task. Each single plot of land was cleared and made cultivable, and in 1934, about 1,500 acres were under cultivation out of a total holding of 1,700 and odd acres. The operation no doubt was time-consuming, and required a great deal of hard labour, but it paid rich dividends, and, in course of time, Shri Kashinath was able to clear his entire debt of the family. The income from the farm began to increase steadily and the family prospered. A further 1,050 acres were also added to the farm.

But Shri Kashinath does not work alone in this undertaking. He is assisted by his brothers, four in number, who by their skill and labour contribute a great deal to ensure prosperity of the estate.

SON KESHAVARAO — A BOON TO THE FAMILY

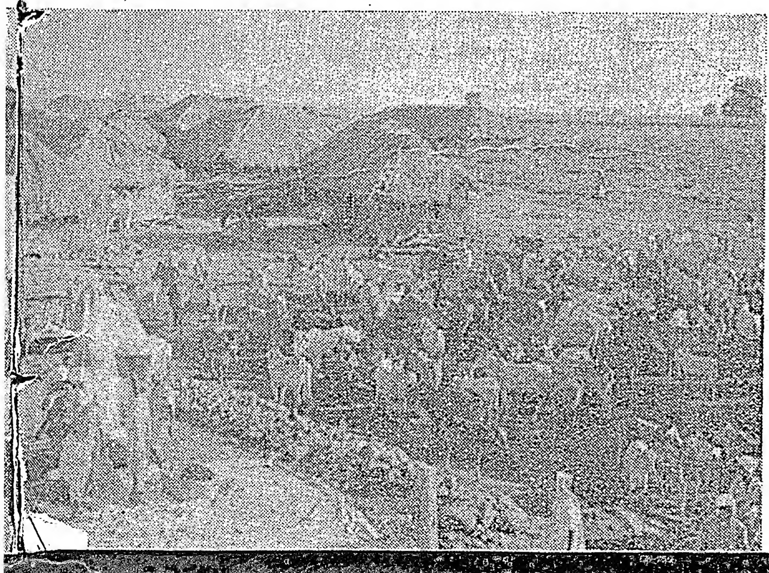
Shri Kashinath's son, Shri Keshavarao, who was born in 1920 in a small hut at Ghatna, has brought further prosperity to the Yerawar family. After matriculating from Yeotmal, he obtained the B.Sc. degree in agriculture from Nagpur in 1945, and since then, the management of the Farm has remained mostly in his hands. At the time he took over from his father, conservative agricultural practices were followed in the surrounding villages. By his example, he initiated the people in these villages to scientific methods. He started with six acres which he put under intensive cultivation and utilised irrigation for raising crops. Pumping sets were installed, and oranges and sugarcane were the first commercial crops to be raised. The total area now irrigated works out to approximately 15 acres. *Gur*-making with improved furnaces was unknown in this area; Shri Keshavarao introduced this method. Side by side he developed a dairy on modern lines.

Chances of a profitable sale of milk seemed remote because Ghatna is situated in the interior of the district and has a population of only about 511 people. Shri Keshavarao thought about the disposal of this and an idea occurred to him. He purchased a separator and started manufacturing butter, which is now the chief product of his dairy. The idea caught the imagination of the people in the surrounding villages, and at present, there are about 15 milk separators working in the locality and the butter produced in this tract is considered one of the best in quality in the neighbouring markets. The separated milk is fed to the calves and is also distributed free to the children in the villages. There are 200 cows of the Hariana breed and 40 buffaloes, mostly Berari, in the dairy, and a first class Hariana bull is kept for stud purposes.

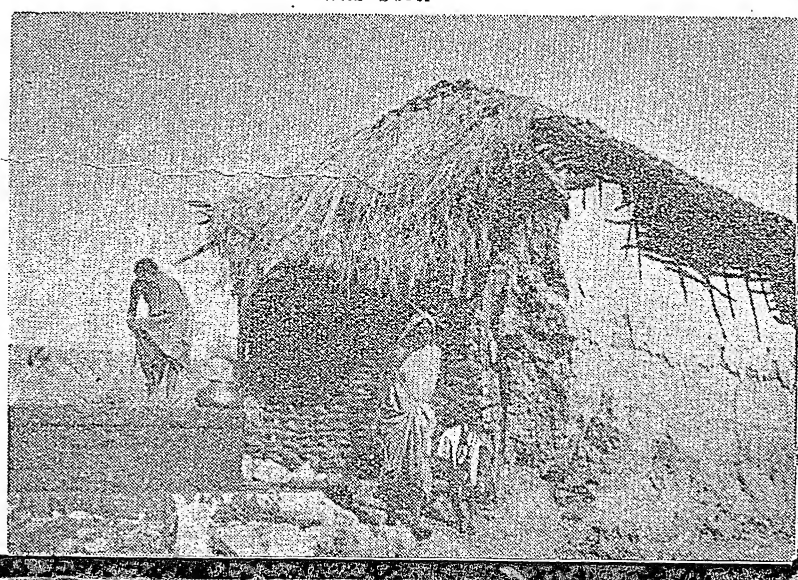
A PROGRESSIVE FARMER

Shri Keshavarao is a machine-minded farmer and has purchased two tractors. Besides, two pumping sets and a power cane-crushing set have also been

Farm animals



The original house at Ghatna, where Keshavarao was born



installed by him. In addition to these he has also got 20 pairs of bullocks. The agricultural produce is transported to Yeotmal in spare time, with the help of the tractors to which trailers can be attached.

The improved varieties of crops evolved and recommended by the Agriculture Department of the State are sown and Shri Keshavarao has been registered as an A-class seed farmer by the Department. The average area under different crops on the Farm is cotton 1,000 acres, *jowar* 800 acres, *tur* 100 acres and miscellaneous crops 200 acres.

Improved agricultural practices such as compost-making, soil conservation methods like bunding, use of improved seeds and fertilisers, and cattle breeding on modern lines have been adopted on the Farm. As many as 3,000 cartloads of farmyard manure are produced on the Farm itself, whereas 1,000 cartloads are purchased from the surrounding villages. In addition, about five tons of fertilisers are used for top-dressing the crops every year.

A SOCIAL WORKER TOO

Shri Keshavarao is also a social worker. He has done much to remove many social shortcomings. To the 120 workers on his Farm, he has provided amenities like housing, medicines, school for children, library and recreational facilities such as games and a radio-set. In fact, much of the success achieved by Shri Keshavarao can be attributed to the whole-hearted cooperation of his contented workers.

With a judicious land management, the net income from the Farm has been steadily on the increase from Rs. 28,000 in 1945-46, after Shri Keshavarao took over the management of the estate from his father, to Rs. 1,10,000 in 1952-53. The figures clearly reveal the potentialities of improved farming methods.

Safeguard your health from the germs in
EVERYDAY DIRT
with LIFEBUOY's
Protective Lather
Everyday, no matter how careful you are, you risk infection from the germs in dirt. Safeguard your health with the habit of bathing often with Lifebuoy Soap. Its protective lather washes away the germs in dirt and keeps you feeling fresh all day.
LIFEBUOY SOAP
LIFEBUOY SOAP
LIFEBUOY SOAP
for everyday protection from everyday germs
L. 230-50

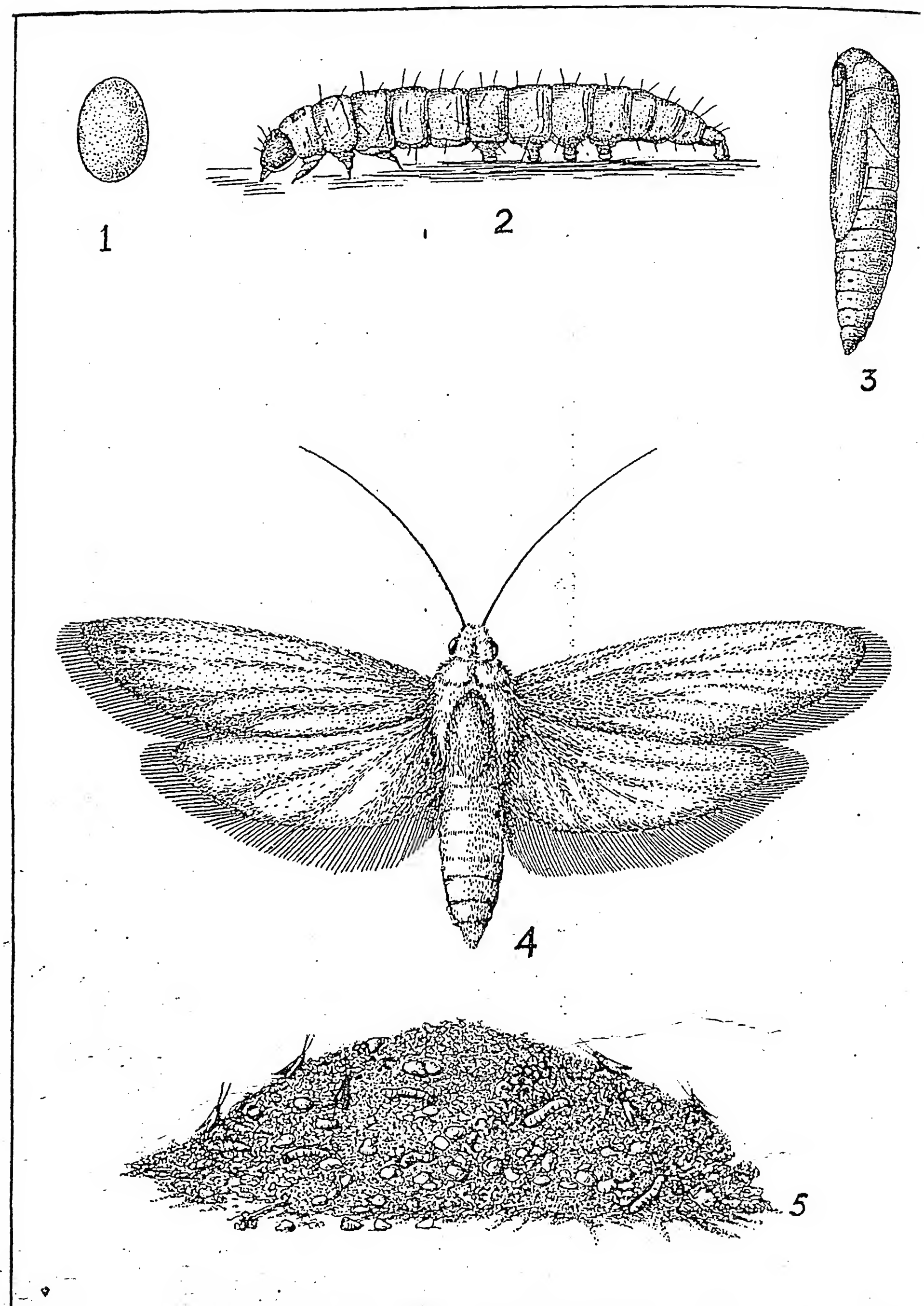
SEASONAL PESTS OF CROPS:

INSECT PESTS OF STO

By
E. S. NARAYANAN,
Head of the Division of
Entomology, I.A.R.I., New Delhi

ONE of the serious problems that we have to face in storing grains in large quantities is the danger of attack by insect pests. It is now fully recognised that the preservation of foodgrains from all avoidable waste and deterioration especially by insect pests is the paramount need of the hour. It has been roughly estimated that in our country 2.5 million tons of foodgrains are destroyed every year by pests of all kinds of which insect pests are the most predominant. In a small but excellently written book recently published bearing the topical title "India's food problem", Sri Gopalakrishnan has shown by well-marshalled facts and figures that India's production of cereals has kept pace with her population and that the volume of her imports has stood fairly constant at 2.5 million tons per year—which is exactly the extent of loss caused by insects and other pests. So if we can, by the application of modern scientific methods, reduce this damage to the minimum, the drain on our national exchequer caused by the importation of grains from abroad will be lessened and the funds thus released could be diverted to other developmental schemes.

Although more than a dozen insect pests have been recorded and are known to infest stored grains in our country, only seven may be classed as major pests. These are the pests that we come across in the farmers' granaries in the villages and in the warehouses and godowns in urban areas. Most of these little monsters, if we may so call them, have gained entry in almost every country in the world on account of their minute sizes that enable them to conceal themselves in a crevice or a crack in the grain. Most of these pests are general feeders but some of them are specific, for instance, the pulse beetles. In this paper the broad outlines of the life-history of these major pests and the methods of their control are described in some detail.

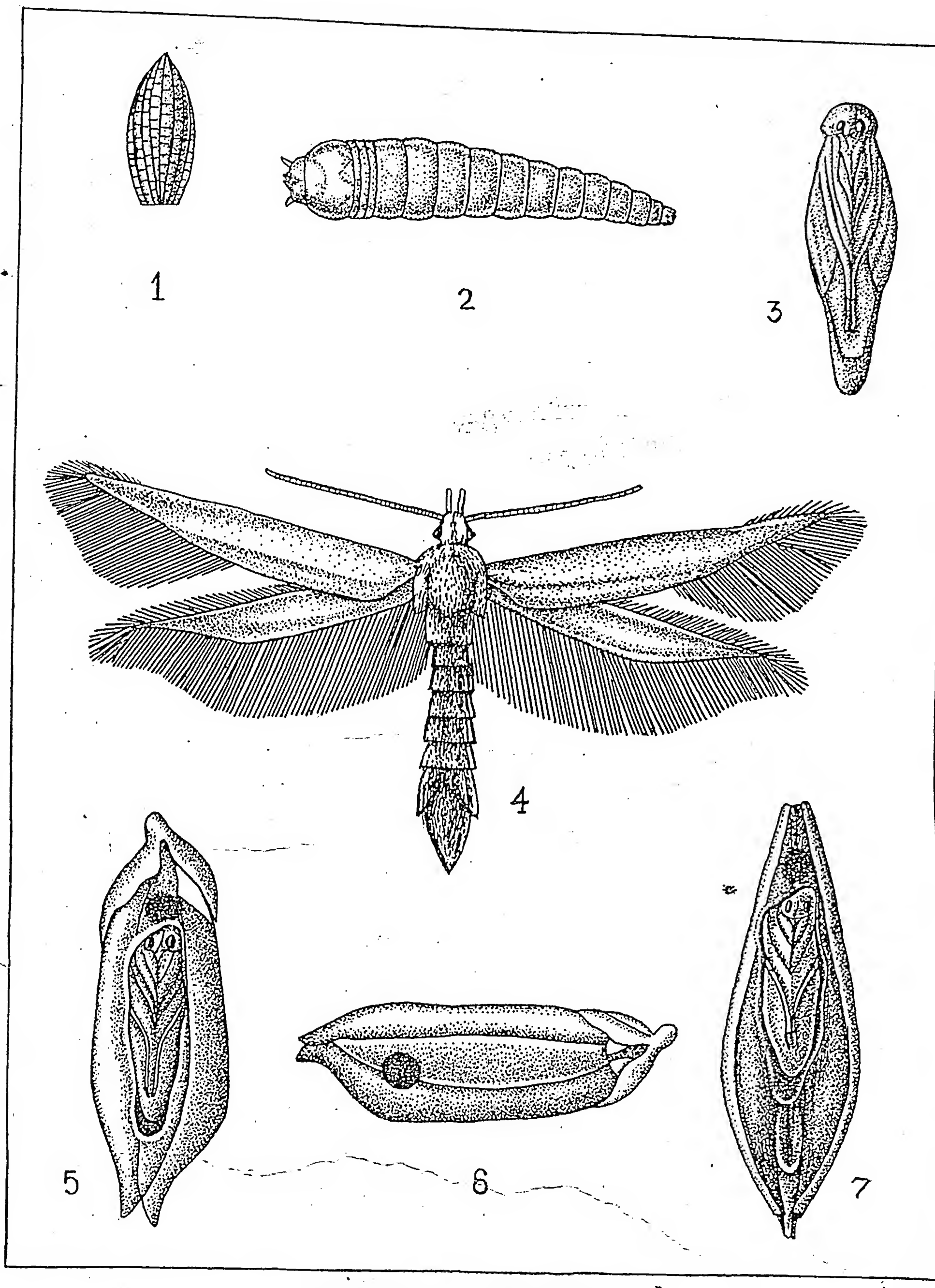


CORCYRA CEPHALONICA

1. Egg, 2. Full-grown larva, 3. Pupa, 4. Adult moth, 5. Heap of broken grain (maize) showing infestation

The following are the pests more commonly met with in the granaries and godowns where grains are stored for varying periods:

1. Rice or black weevil, *Sitophilus oryza* Linn.
2. Lesser grain borer, *Rhizopertha dominica* Fab.



SITOTROGA CEREALELLA

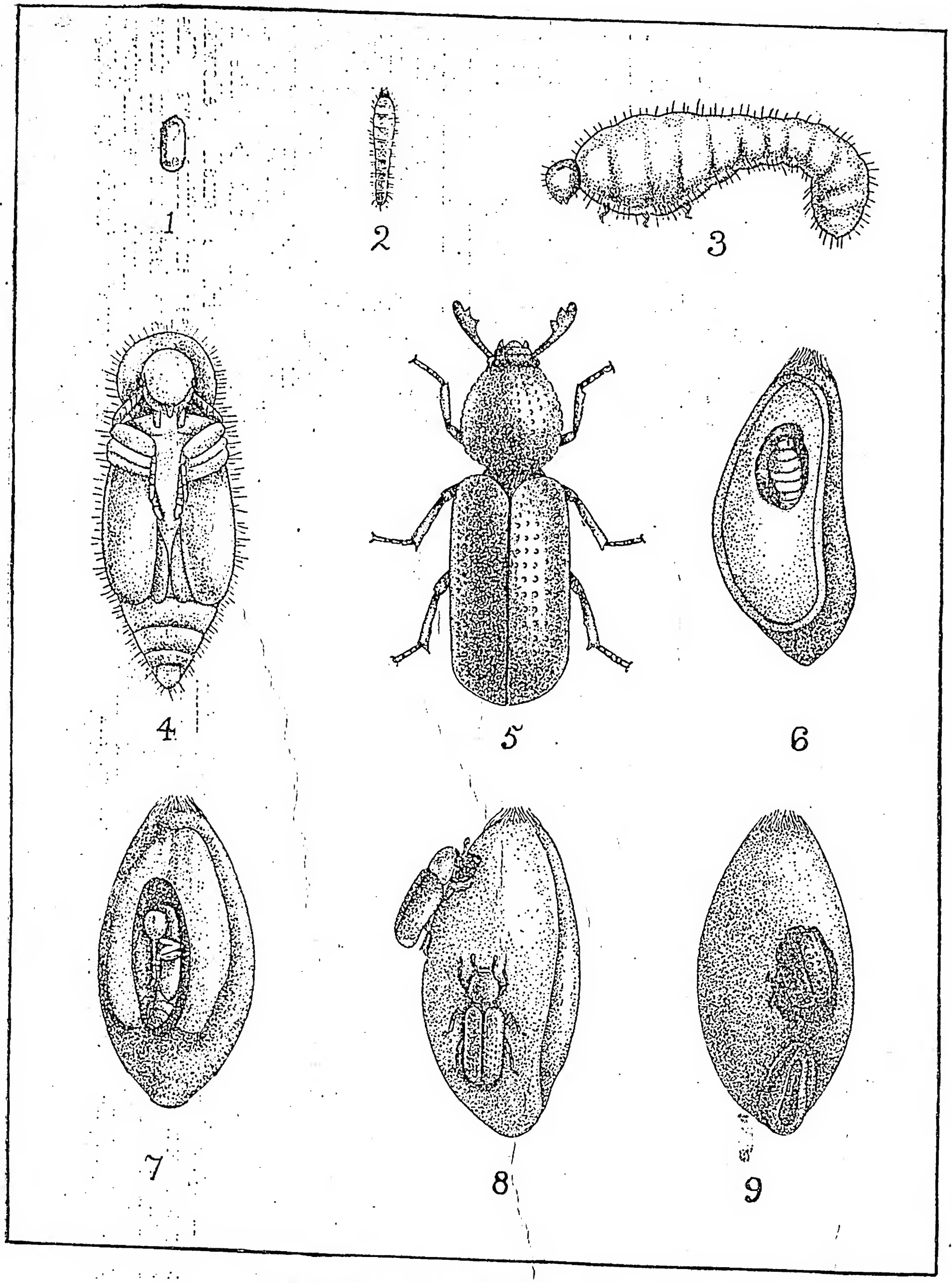
1. Egg, 2. Full-grown larva, 3. Pupa, 4. Adult moth, 5. Infested paddy showing pupa inside, 6. Paddy showing emergence hole of moth, 7. Infested barley showing pupa inside

3. *Khapra* beetle, *Trogoderma granaria* Everts.
4. Rust-red flour beetle, *Tribolium castaneum* Herbst.
5. Pulse weevil, *Callosobruchus chinensis* Linn.
6. Angoumois grain moth, *Sitotroga cerealella* Oliver.
7. Rice moth, *Corcyra cephalonica*, Staint.

SITOPHILUS ORYZA

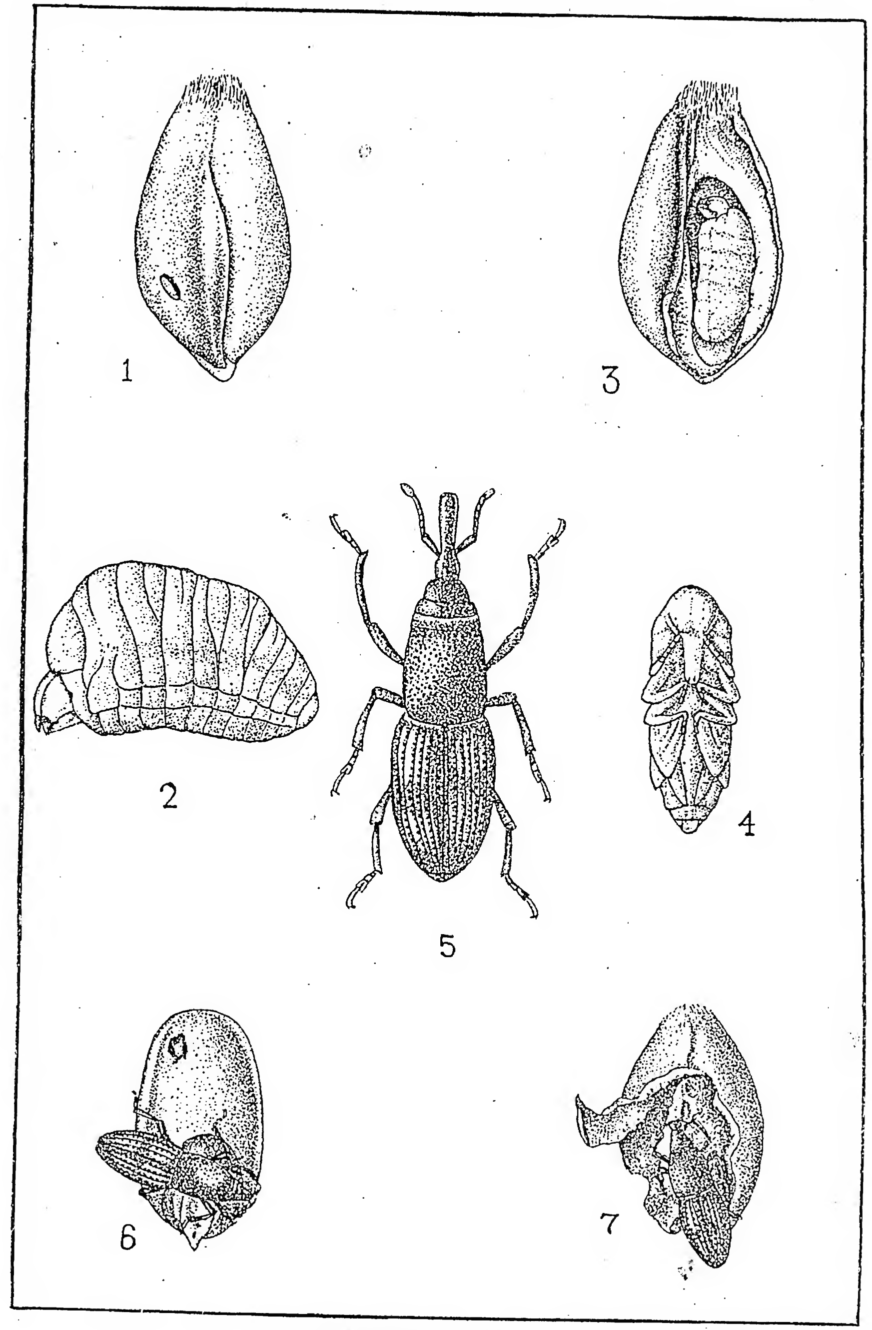
This pest, popularly known as the rice weevil, is undoubtedly the most destructive of the stored grain pests in the world. Indeed this weevil and its friend and ally *Sitophilus granarius* Linn. are classed among true weevils, as the mouth parts of these pests are prolonged into an elongate beak or snout crowned by a pair of stout mandibles, their chief weapon to cause destruction. Some entomologists believe India to be the original native home of this weevil. Be that as it may, the pest is now found all over the world and in countries blessed with a temperate or sub-tropical climate it is the predominant insect pest of stored grains. It is a small beetle, reddish brown in colour, and is about one-eighth of an inch long. It is capable of short flights. It has sometimes been observed to fly from the granaries to the field where the grains lie harvested. So in such cases the infestation starts from the field itself.

In India it has been observed only as a primary pest in the granaries and godowns. Both the adults and larvae are voracious feeders and although it is known as the rice weevil it feeds on all kinds of cereals and their products in India. The female weevil bores a small hole in the grain with her powerful sharp mandibles and lays in the cavity thus made an egg and bestows a measure of motherly protection on the future progeny by covering the egg by means of a gelatinous fluid. The egg is oval in shape, transluscent and white in colour and measures 0.7 mm. long and 0.3 mm. broad. One female is capable of laying as many as 250 eggs. The eggs usually hatch in about three days during the monsoon months beginning from July to September. The tiny grub after hatching bores its way into the kernel of the grain and makes a meal of it for its growth and development. The grub is white in colour with a small yellowish brown head and biting jaws. The grub stage lasts for about three weeks to a month. The full-grown grub pupates inside the hollow



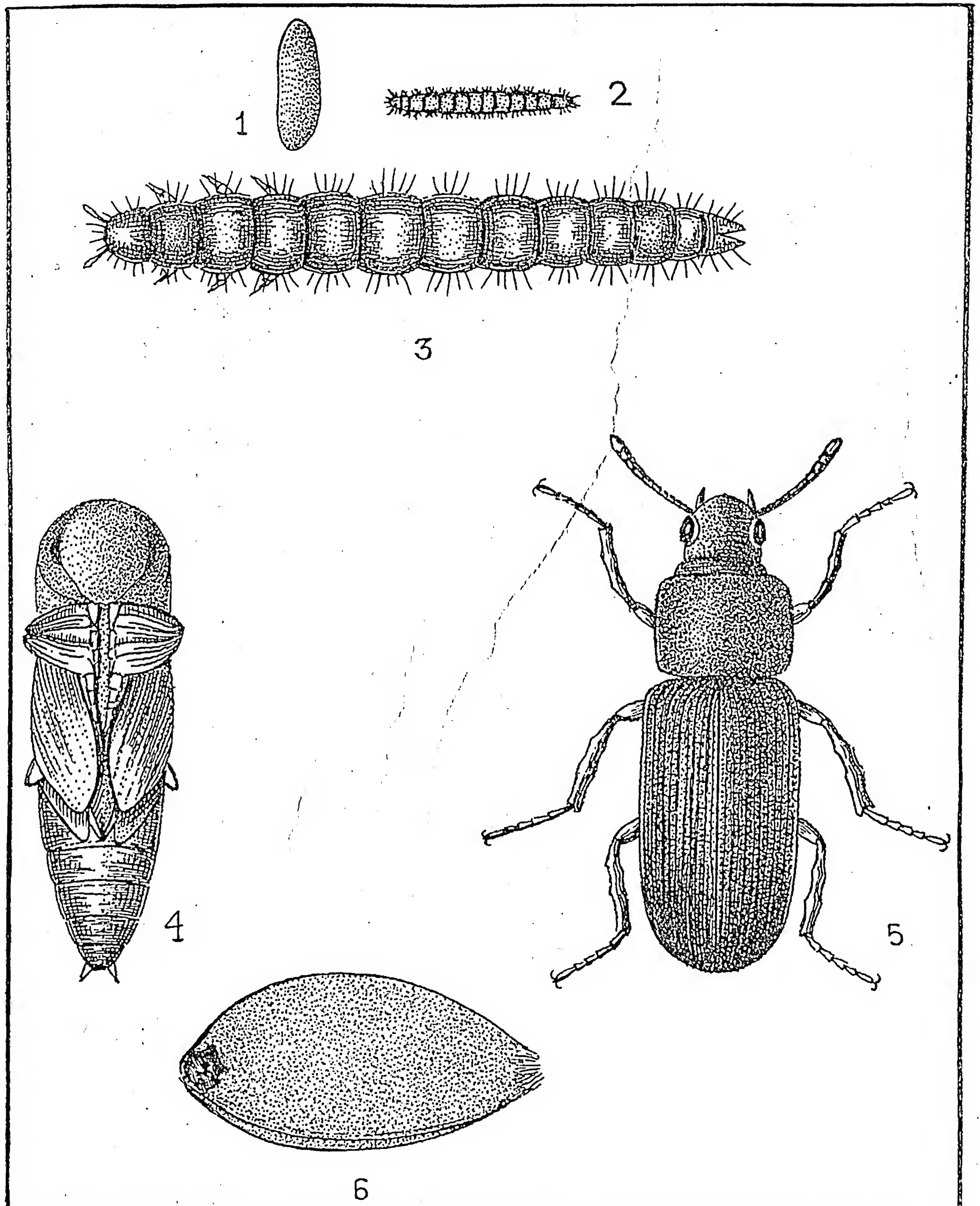
RHIZOPERTHA DOMINICA

1. Egg, 2. Freshly emerged larva, 3. Full-grown larva, 4. Pupa, 5. Adult beetle, 6. Damaged wheat showing larva boring inside, 7. Damaged wheat showing pupa inside, 8. Beetles attacking sound grain, 9. Beetle that has bored in



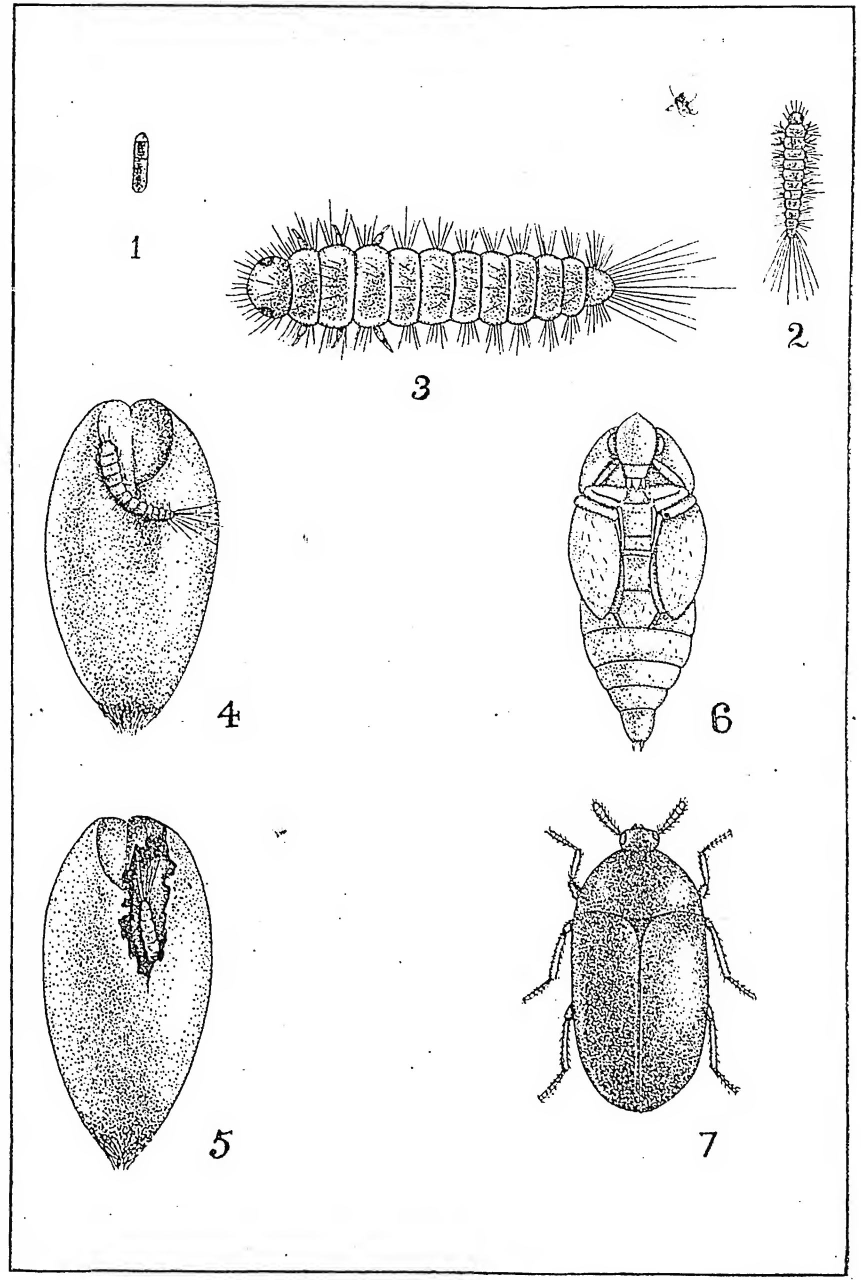
SITOPHILUS ORYZA

1. Egg laid on wheat grain, 2. Full-grown larva, 3. Wheat grain showing larva boring inside, 4. Pupa, 5. Adult beetle, 6. Beetle attacking a wheat grain, 7. Wheat grain that has been damaged by the beetle



TRIBOLIUM CASTANEUM

1. Egg, 2. Freshly-emerged larva, 3. Full-grown larva, 4. Pupa. 5. Adult beetle, 6. Wheat grain that has been damaged at one end by beetle



TROGODERMA GRANARIA

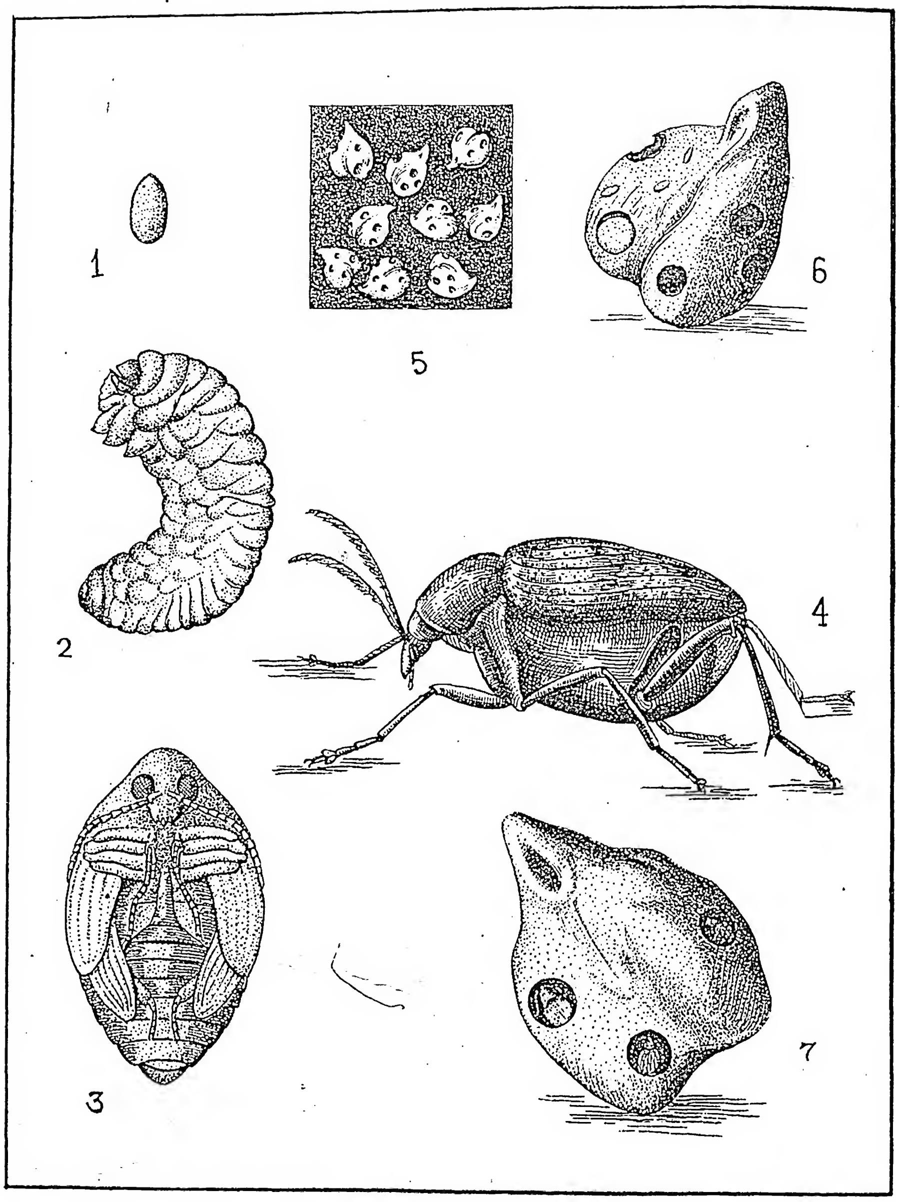
1. Egg, 2. Freshly-emerged larva, 3. Full-grown larva, 4. Larva attacking wheat grain, 5. Larva that has bored into wheat grain, 6. Pupa, 7. Adult beetle

grain. The pupal period lasts from three to six days. The adults that emerge, mate almost immediately and new generation starts. The adults that emerge in spring and summer are short-lived. Their longevity does not extend to more than a month or a month and a half. Those that emerge in winter live long sometimes to several months. The duration of the life-cycle and the number of generations in a year depend to a considerable extent on the prevailing temperature and humidity conditions. In India four to five generations occur in one year especially in the North. The number of generations is probably more in the South where there is no clear cut winter.

RHIZOPERTHA DOMINICA

This pest commonly known as the lesser grain borer is only second in importance to *S. oryza* in the extent of damage and destruction caused to stored grains. It is a major pest of nearly all cereals and has been recorded and reported from the U.S.A., Argentina, New South Wales and many other countries outside India. In addition to its destructiveness to stored grains, it feels at home in flour also and breeds readily in it. A dark brownish black beetle of about one-eighth of an inch in length, this pest is readily distinguished from the other grain pests by its slender form and comparatively smaller size. The beetle is capable of flying longer distances than *S. oryza*.

Although both the adults and the larvae cause colossal destruction to a variety of grains reducing them to mere papery shells or converting the flour into a tangled mass of web and excreta, it is only the adults that can directly bore into the healthy grain. The larvae are weak and are unable to accomplish this feat of their parent and so they go in search of soft corners or minute holes made for them either by their own parents or by the stronger cousins of their own age. The female lays eggs on the grain singly or in clusters near the embryo. Sometimes eggs are laid on bags, walls and among other foodgrains lying in the store. A single female is capable of laying as many as 500 eggs. The eggs are pear-shaped and white in colour. The incubation period is four to six days in summer and a little longer during the winter months. The newly hatched grub is whitish in colour and is very active. They complete their growth either within the grain or in the grain dust that lies about and transform themselves into white pupae. The larval stage lasts from four to six weeks. Adults emerge from these pupae in about a week or so. The whole life-cycle occupies about two months. Five generations have been observed in a year in the North and the number is probably more in the South.



CALLOSOBRUCHUS CHINENSIS

1. Egg, 2. Full-grown larva, 3. Pupa, 4. Adult beetle, 5. Grains showing emergence holes of the beetles, 6. Grain showing eggs laid on it as also emergence holes, 7. Grain showing beetles resting inside

TROGODERMA GRANARIA

This pest is known as *khapra* in the towns and villages of India and has been observed to feed on a variety of grains like wheat, rice, oats, *jowar,* maize, and sometimes even pulses. Wheat, however, is its principal food. This pest is probably the hardiest amongst the little monsters that infest stored grains in the Indian Union. Outside India it has been reported from the European countries. In the U.S.A. it has not established itself so far. Unlike the other two pests that have been described

above, only the grub stages are destructive in the case of *khapra*. The adults are completely harmless. Even the adults cannot bore into the grains so well as the preceding two pests and it is only the upper surfaces of grains that are nibbled at and damaged as a result of the attack.

The adult is about one-tenth of an inch long and has a characteristic oval shape. They mate soon after emergence and the preoviposition period is from five to six days. Eggs are usually laid among the grains. One female is capable of laying as many as 125 eggs. They hatch in about a week under humid conditions and the period is longer under dry conditions. The freshly-hatched grubs are brownish white in colour with the body covered with reddish brown hairs that form a broom like tail at the posterior end. These grubs generally feed on the floury debris in food grains but sometimes attack the embryo point of sound grain also. If the infestation is heavy the grubs enter the grains and feed inside and are seen in a crescent shape form under the epidermis. If there are crevices or holes present in the grains, these grubs take advantage of these weak points and gain easy access to the kernel and consume it entirely. The larval period lasts for about 50 days under optimum conditions. When conditions are unfavourable this period is oftentimes very very long and in rare cases may even last upto one, two or even three years. The pupal stage lasts from 6 to 17 days during the humid months. The longevity of the adults is about a month under favourable conditions.

TRIBOLIUM CASTANEUM

This insect belongs to the category of such beetle pests of stored grains that are not primary pests but feed on broken grains, grain dust or grains damaged by other pests. So the appearance of this pest in the granaries and godowns may be considered as secondary following closely the footsteps of its other comrades. Indeed the grains that are partially damaged by the true grain beetles afford a welcome opportunity for this pest to complete the work of destruction begun by them. It is a small reddish brown beetle about one-eighth of an inch long and is commonly known as the rust-red flour beetle. The pest is distributed all over the world. Unlike *S. oryza* and *R. dominica* in whose evil company it is oftentimes found associated, this beetle cannot damage sound grains either in the adult or larval stages. It is primarily a pest of prepared cereal products like *atta, maida, suji*, etc. When there is heavy infestation, the products turn yellow and become mouldy with frass and excreta of the grubs and the adults rendering the foodstuff totally unfit for human consumption. The female lays on an average 400 to 500 eggs, dropping them at random in the flour or other foodstuffs. The egg is tiny, slender and cylindrical in shape and white in colour. It hatches in about 5 to 12 days depending on the temperature and humidity conditions. The newly hatched grub is worm-like in appearance, slender, cylindrical and wiry. The full-grown grub is about quarter of an inch in length and pale yellowish in colour. The larval period lasts from 27 to 90 days depending on the availability of food and the prevailing ecological conditions. The larvae generally pupate on the surface of the food. The pupal period lasts from six to nine days. The life-cycle from egg to adult may be as short as six weeks but oftentimes it is longer.

CALLOSOBRUCHUS CHINENSIS

This is a very serious pest of stored pulses in the Indian Union. There is another closely allied species, *Bruchus analis* F. that is found in association with this pest. As *C. chinensis* is more common of the two, the life-history of this pest is described here. In America, the pest is popularly known as the cowpea weevil. The adult is a small roundish beetle about one-eighth of an inch in length, generally brownish in colour and flecked with white, black and greyish patches. All kinds of pulses are attacked by this pest and bags of pulses stored in a godown may be completely destroyed by these hungry weevils whose voracious appetite is almost insatiable. Neat circular holes cut on the body of the grains are very characteristic of the damage caused by this beetle pest. The females lay eggs singly but usually many eggs are laid on one grain. These eggs look

(*Contd. on page 26*)

THE RAT

THE rat is one of the most destructive enemies of man. It attacks buildings, food-grain, growing crops, etc. It can scale walls and swim through water. A carrier of infection and diseases, it multiplies very quickly. It is surprising, yet true, that one pair of rats can produce millions of rats in a couple of years.

RATS CARRY DISEASE

The rat harbours a number of parasites, such as lice and fleas, which are carriers of virulent diseases. Plague germs are carried by the rat and transmitted to man through the fleas. Plague is a dangerous disease which, if not correctly diagnosed and properly treated, can be fatal. Rats are also responsible for the spread of typhus fever which can take a heavy toll of human life.

Rat-bite fever is caused by rats biting human beings. Food contaminated with the excreta of rats when eaten may give rise to food poisoning, with vomiting and diarrhoea and may even cause death if the liver happens to be damaged.

RATS DESTROY FOOD AND CROPS

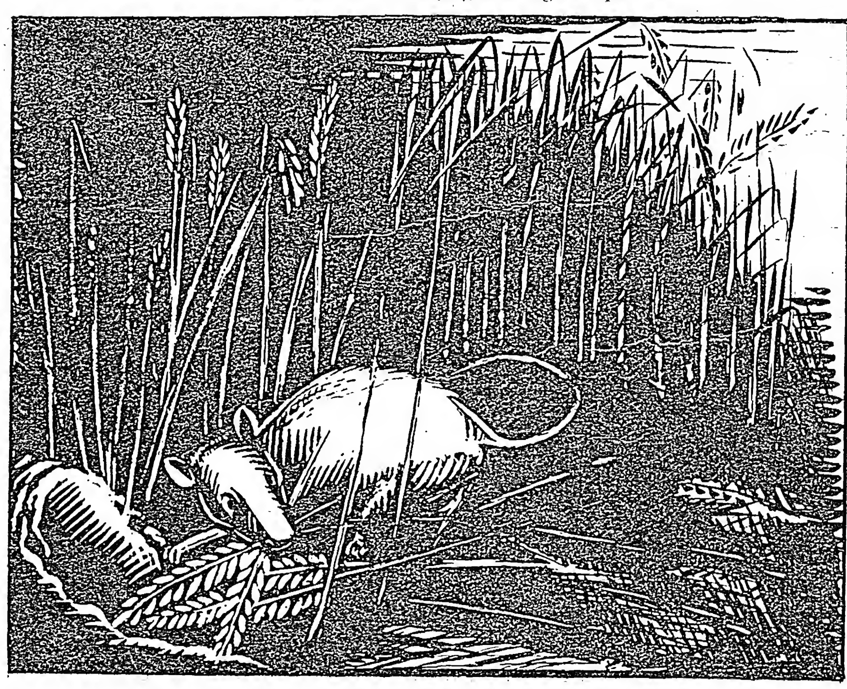
Apart from transmitting diseases to man, rats destroy food, crops, merchandise and property. They attack vegetables, fruits and the growing crops, and infest homes, factories and market places. They nibble at the currency notes kept by the villagers in earthen pots, and have been known to have set fire to buildings by damaging the insulations of the electric wires.

DO NOT GIVE RATS A FREE MEAL

Rats feed mostly on garbage. Therefore, all garbage or waste matter should be collected in closed containers on a raised and waterproof platform. Nothing should be thrown or spilled or scattered on the floor.

Cooking and eating utensils should not be exposed for a long time. If they cannot be cleaned immediately they should be kept

Rats destroy growing crops



covered. All food and vegetables as well as *ghee* and oils must be kept covered, preferably on shelves. If birds are to be fed, a special bird stand should be built so that grains are not scattered on the ground.

HOW TO KEEP OUT RATS

A house can be made rat-proof by erecting a firm foundation and a plinth of stone six inches below and above the ground. Doors and windows should be well-fitting with no spaces for the rats to wriggle through. If a strip of metal is nailed along the bottom of the door, leaving just enough clearance for them to open freely, it will help keep out the rats.

The brick work on all the lower portions of the walls should be inspected from time to time, and damages repaired. Rats can also enter the house through water or drainage pipes; the openings should be covered with wire-gauze.

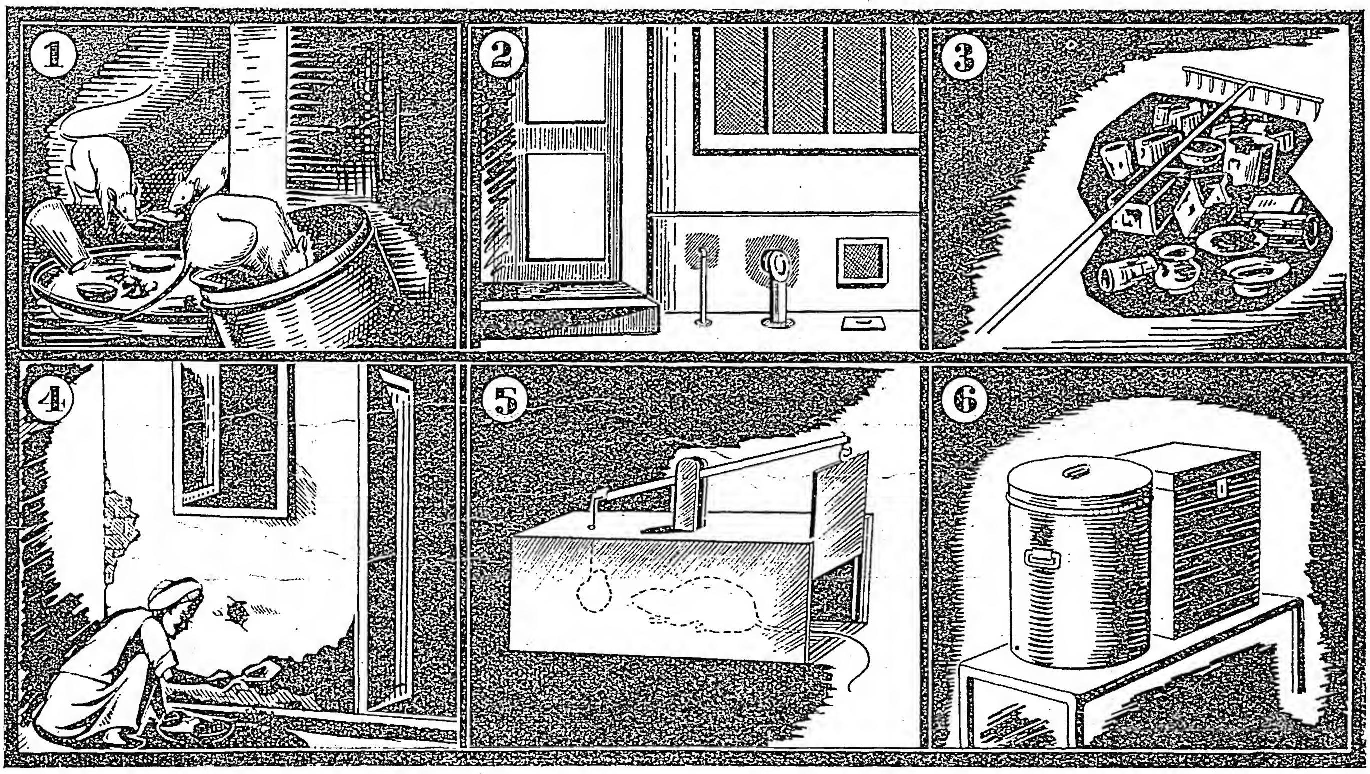
Broken pots and pans, empty boxes, rags, bits of paper, etc. are ideal hiding places for rats. These should be collected and disposed of.

To store grains in the house, proper granaries should be built or the grain should be filled in bags and placed on a raised platform. If stored in specially constructed containers with tight-fitting heavy lids, grains will be out of the reach of rats.

EXTERMINATION OF RATS

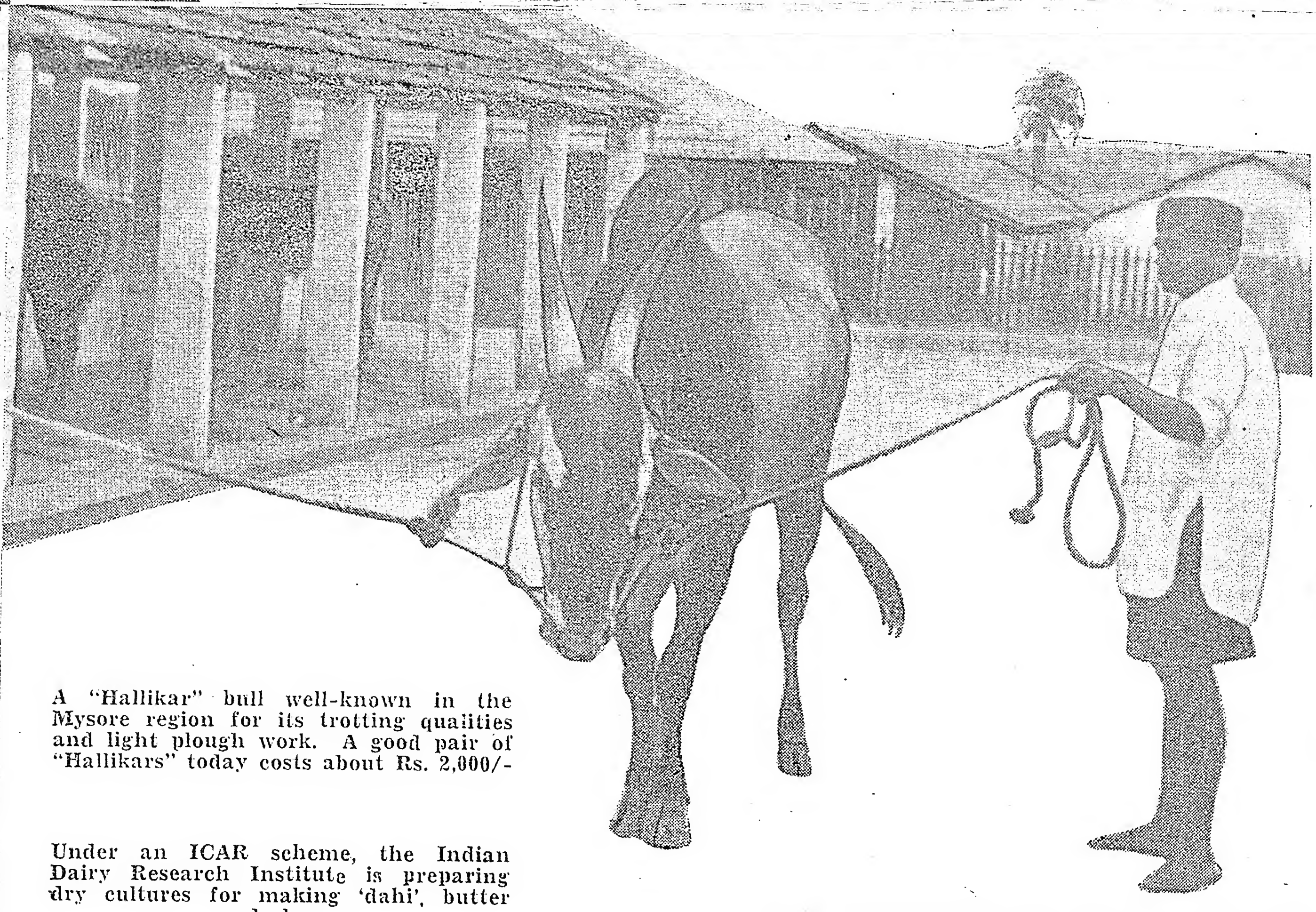
Rats can be exterminated by poisoning them or by trapping them. There are several ways of trapping them. All trapped rats should be killed and not let loose. For poisoning a stale piece of bread or flour mixed with oil may be used as a bait. The bait should be laid without poison or trap for several days, and from the amount of "take", as it is called, the number of rats present in the building may be calculated. The confidence of the rats is also thus gained and it becomes easy to kill them by mixing poison with baits afterwards.

The ideal poison is that which causes bodies of the victims to shrivel up rather than decay, as decomposed bodies emit unpleasant odours. Among the known poisons for rats are barium carbonate, red squill, 1080, Antu and Warfarin. Cynogen gas is also very effective, but it requires expert handling and special equipment, and can be used only if service and equipment are available.



1. Do not expose cooking and eating utensils for a long time, 2. Build rat-proof houses, 3. Broken pots and pans, empty boxes, rags, bits of paper, etc. should be collected and disposed of, 4. Holes in the walls should be closed with cement, 5. Rat traps may be used; 6. Store grains in specially constructed containers with tight-fitting heavy lids

20 ye
selecti
breedi
at C n
Resea



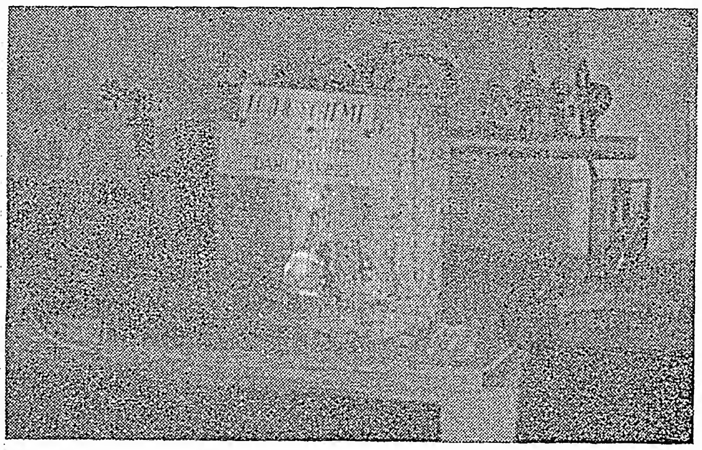
A "Hallikar" bull well-known in the Mysore region for its trotting qualities and light plough work. A good pair of "Hallikars" today costs about Rs. 2,000/-

DELEGATES from the South-East Asian countries to the F.A.O. Regional Conference held at Bangalore in July-August expressed the view that the Red Sindhi herd of cows which they had seen in India, were the best in the whole of Asia.

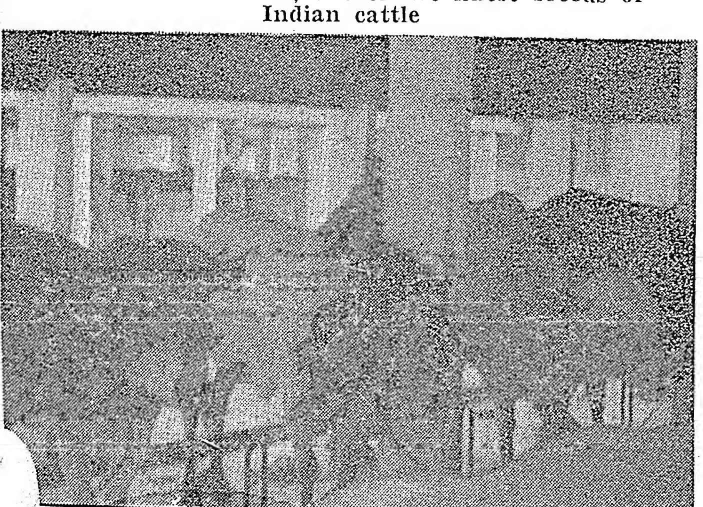
The original home of the Red Sindhi cow is an area which now forms part of Pakistan; the tribute, therefore, from foreign observers is a signal recognition of the work done by the Indian Dairy Research Institute at Bangalore during the last 20 years. For it was at this Institute that the delegates to the F.A.O. Regional Conference saw the magnificent herd of Red Sindhi cows, each of which would today fetch Rs. 2,500 in the export market.

The work done at the Central Dairy Research Institute is not, however, confined to the maintenance of pedigree herds of cattle and their breeding only. The scope of this central organisation is much wider;

Under an ICAR scheme, the Indian Dairy Research Institute is preparing dry cultures for making 'dahi', butter and cheese

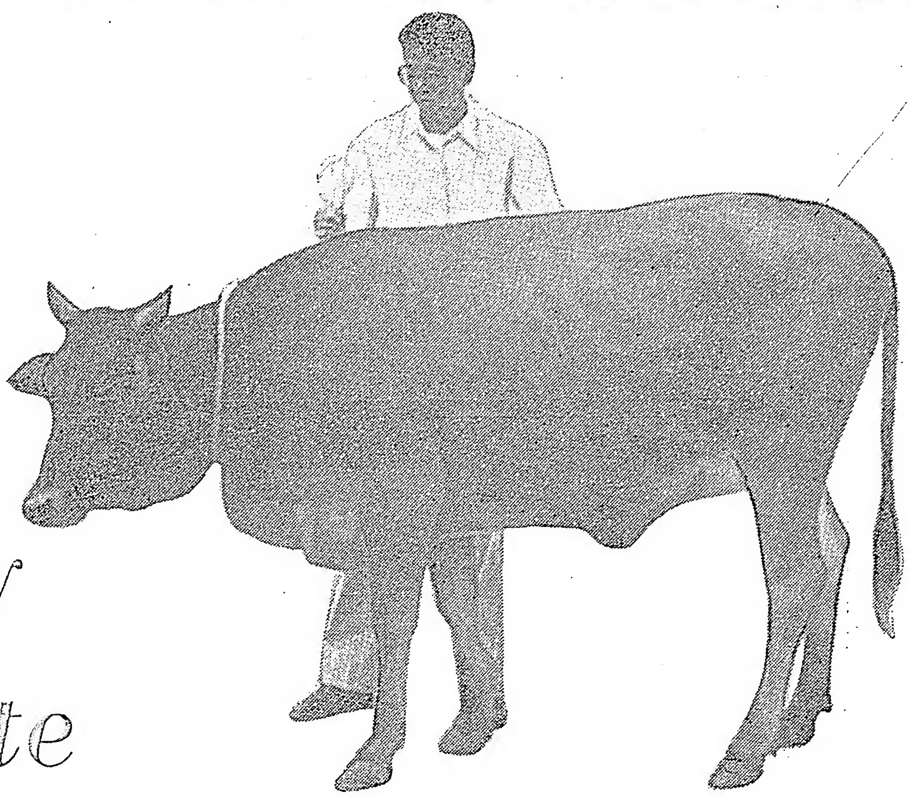


A shed of 'Gir' cows, one of the finest breeds of Indian cattle



Over 20 acres are sown to perennial fodder crops. A field of "guinea grass" in the Dairy Research Institute

...ars of ...e cattle ...ng work ...tral Dairy ...ch Institute



The first calf produced in India sired by a Jersey bull, whose semen was flown from London to Bangalore. This Red-Sindhi-Jersey cross is itself in calf

By A. R. VYAS

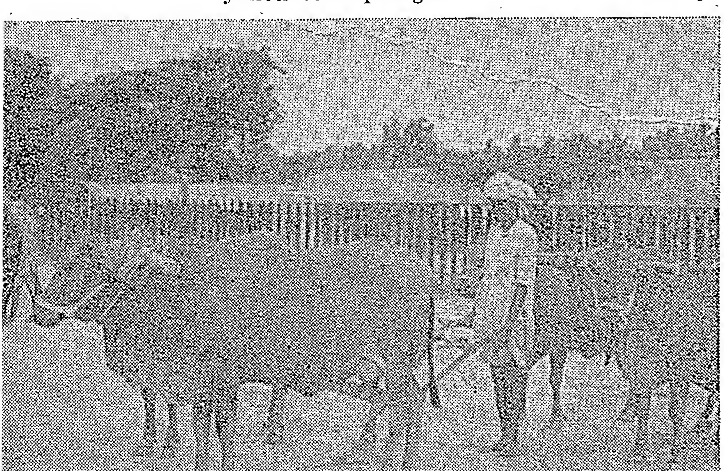
its activities cover dairy research, the development of pedigree herds of milch cattle and the training of students in the science and practice of dairying.

The cow, the country, and the milk demand of military personnel — so begins the story of dairy farming in India ! And that of the Indian Dairy Research Institute is no different. On its present site, a military dairy farm was started in 1907, which continued till 1923. In that year the Government of India, recognising the need for an Institute which could supply personnel trained in modern dairy methods, and which could also provide technical help and advice to the dairy trade, took over the military farm at Bangalore together with its sub-station at Wellington (Nilgiris) and started the Indian Dairy Diploma course. Another military farm at Karnal (Punjab) and later the military creamery at Anand (Gujerat) were also taken over and used as sub-stations for a number of years, but at present there are no sub-stations attached to the Central Institute. The work of breeding and developing pedigree herds of cattle was started in the year 1933 and about eight to ten years later, the Institute was also equipped with some facilities for conducting research work in dairy science.

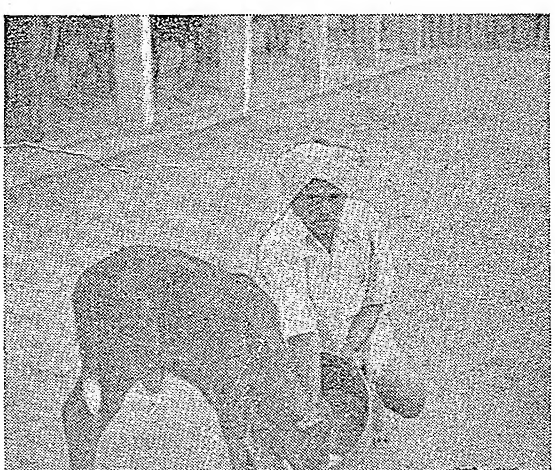
The Dairy Diploma course at the Institute, which trains dairy technicians for the industry, attracts students from all parts of India as well as from the adjoining countries of Ceylon, Burma and Pakistan. Short practical courses are organised for the average man in the dairy trade or profession, and facilities are also provided to the graduate and post-graduate level of workers for advanced research in dairy science.

(Contd. on page 31)

The Dairy Research Institute is conducting experiments on a "dual purpose" cow. Red-Sindhi cows yoked to a plough

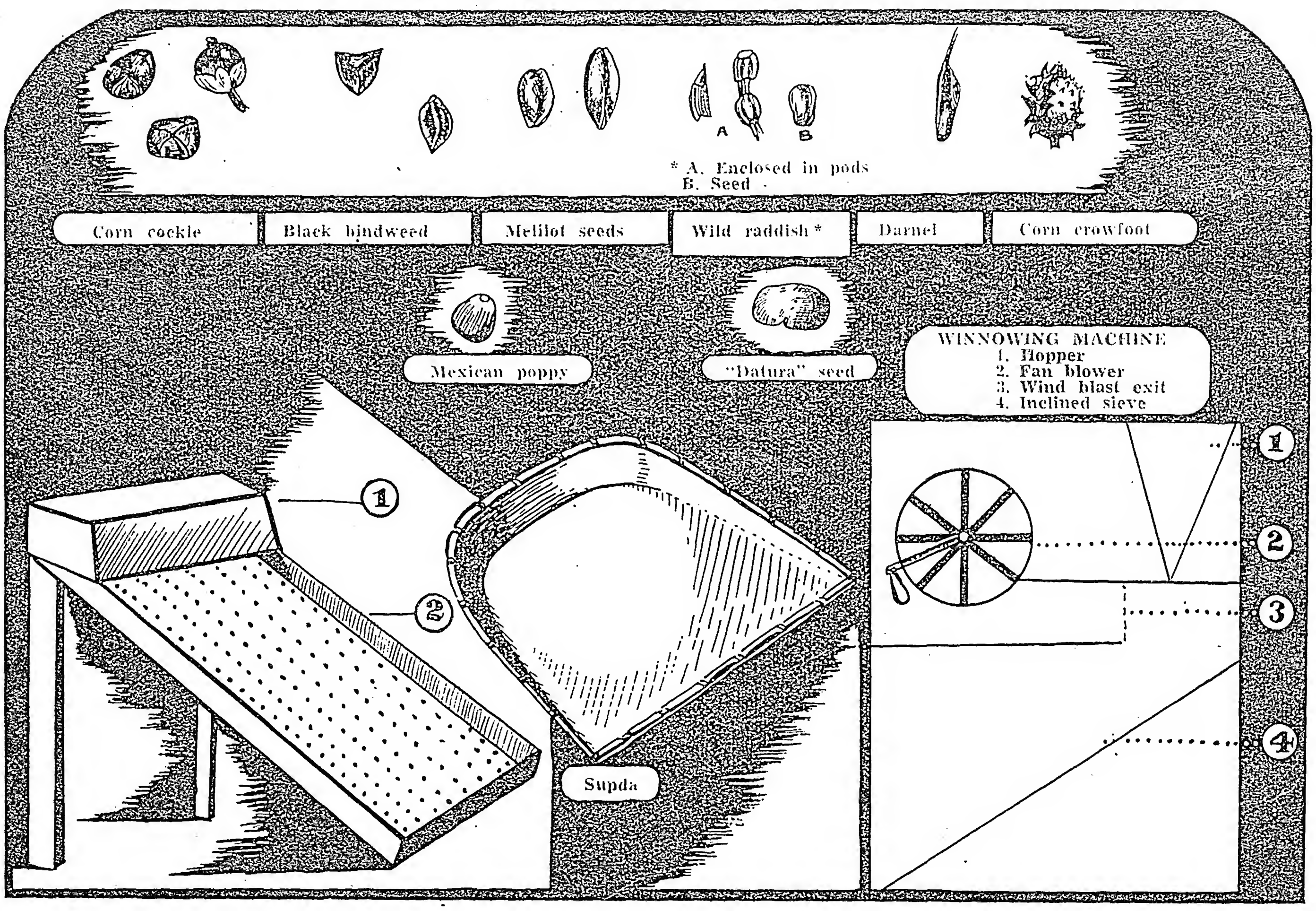


All calves are weaned from birth. A new born calf being fed on a mixture of cow's milk and skimmed milk



CLEANING AND CONDITIONING OF FOODGRAINS

By
S. V. PINGALE and R. C. BHUTIANI,
Central Food Technological Research Institute, Mysore



HOPPER SIEVE STAND 1. Hopper for putting in grains
2. Pair of sieves

IMPURITIES and foreign substances of undesirable nature have been found mixed with the foodgrains, both imported and locally produced. Apart from adversely affecting the health of the consumers, who cannot afford to lose any proportion of their rations, these impurties are a source of great inconvenience and annoyance to them. The problem is, therefore, important enough to merit attention.

No systematic studies have been carried out to determine whether these impurities when taken in cause any toxity or not. Information available from various sources, however, shows that impurities of the type of insect fragments cause irritation in the stomach, whereas weed seeds such as *datura,* darnel, etc. have narcotic effects. These and other impurities like chaff, mud, pieces of stone, etc., therefore, prevent the consumer from having his money's worth.

The weed seeds and other foreign matters get mixed up with the grains during the processes of harvesting and threshing. The imported grains which are harvested and threshed mechanically usually contain weed seeds, chaff, husk, broken grains, unripe and shrivelled grains, etc. On the other hand, Indian grains which are harvested and threshed with manual or animal labour, are very often cleaner and to a great extent free from impurities.

VARIOUS FOODGRAINS AND THEIR IMPURITIES

The various foodgrains and the impurities generally associated with them are given below:

Name	Shape and colour of grains	Impurities
Canadian (Manitoba) wheat	Small, angular, blunt-ended hump-backed in shape and golden brown in colour	Proportion of impurities fairly low, being mainly black bind-weed, chaff, oats, frosted grains and occasionally buck wheat, melilot, wild mustard and other small seeds
American wheat	Small, plump or long, thin in shape and medium straw and amber or golden brown in colour	Impurities upto four per cent being mainly chaff, oats, barley and small seeds
Australian wheat	Medium-sized and mild cream in colour	Impurities generally not more than two per cent being mainly chaff, straw and oats and occasionally melilot, black weed, eucalyptus leaves and darnel
Argentine wheat	Medium-sized and angular in shape and golden brown in colour	Proportion of impurities varies between three and five per cent being mainly oats, barley, maize, wild radish, melilot and other small seeds
Russian wheat	Medium-sized and plump and light to golde: . brown in colour	Impurities comparatively less being mainly rye, barley, cockle and other small seeds
Indian wheat	Large, plump and hunch-backed in shape and cream or light brown in colour	Impurities up to six per cent being mainly unthreshed grains, barley, oats, peas, gram, other small seeds (rare), mud and stones
English wheat	Short, plump and light to golden brown in colour	Impurities up to five per cent composed of a wide variety of weed corn seeds such as wild mustard, darnel wild radish, black bind-weed, corn cockle, garlic, turnip, chaff, oats and barley
African wheat	Long and golden brown in colour	Impurities up to six per cent composed of a wide variety of weed seeds such as wild mustard, argemon, darnel, *datura*, oats, rye, chaff, etc.
China milo	Small, flat and light red in colour	Practically free from impurities
American milo	Round in shape, plump and red in colour	Impurities up to five per cent being mainly dust, chaff, straw and small weed seeds and also broken grains from three to seven per cent
Indian *bajra*	Small, oblong in shape and ash-like in colour	The types of impurities depend on locality in which the grain is produced being mainly dust, stones, small weed seeds and occasionally pulses and husk
Indian *jowar*	Medium, flat, oblong in shape and white to reddish white in colour	*Kharif* grain as compared to *rabi* grain is soft and white and contains dust, mud and stones; *rabi jowar* contains husk, and fungus-damaged grains from pit storage

It will be seen that the proportion of impurities in the various grains is about four per cent on an average, although, at times, these have been reported to be present to the extent of about 20 per cent. While systematic investigations have been carried out in other countries to determine the effect of various impurities on the quality of bread, scientific study of such problems in respect of *chapati* and *paratha* has not yet been undertaken. Impurities may be broadly classified into three groups: (i) those which besides causing food poisoning affect the quality of the cooked product, e.g.

ergot, *datura*, darnel, argemon, cockle, smut etc.; (ii) those, which merely impair the quality of the finished product, e.g. non-poisonous grains (other than the main grain), seeds, dust, excreta or body parts of insects, rodents, etc.; and (iii) those which affect the nutritive value of the grains and cause damage to the machinery during milling, e.g. stones, straw, chaff, pieces of metals and thread. The impurities of the first and second type are due to the defects in the method of cultivation and handling of grains, whereas those of the third type are due to faulty methods of storage and transportation.

DESCRIPTION OF COMMON IMPURITIES

Some common impurities met with in foodgrains are described below:

Name	*Shape, size, etc.*
Weed seeds	
Corn cockle (*Lychnis githago*)	Dimensions between 3 and 4.25 mm., globular in shape and rough to touch; usually, pods which are dull brown or black in colour, are present with their stalks
Black bind-weed or wild buck wheat (*Poygonium convolvulos*)	Dimensions between 3 and 4.25 mm., three-sided in shape similar to buck wheat but small in size and covered with a thick dark brown or jet black skin; even a small quantity of it affects the colour and flavour of bread
Melilot (*Melilotus officinalis*)	Dimensions between 2 and 3 mm., oval in shape and yellowish green to green in colour; they taint the bread
Vetches	Spring vetch (*Vicia sativa*) is a farm crop and French vetch (*Vicia sepium*) is a weed; dimensions between 4.25 to 6 mm., similar to sweet peas and brown to black in colour
Wild radish—a jointed charlock (*Raphenus raphirustrum*)	Dimensions between 3 to 4.25 mm., irregular in shape and light brown in colour resembling small pieces of stone
Darnel (*Lolium temerlentum*)	Elongated and yellowish brown in colour; enclosed in an outer husk which has an awan-like appendage; has a narcotic effect
Wild mustard (*Sinapis arvensis*)	Dimensions not exceeding 2 mm., very small in size round in shape and brownish black in colour
Corn crowfoot	Oval in shape and having sharp projecting spines around it
Cow wheat (*Melampyrum sp.*)	Dimensions between 3 and 4.24 mm., similar to wheat but much smaller in size and reddish brown in colour
Datura	Brown to black in colour and kidney-shaped having a sharp, bitter and acrid taste; narcotic or emetic in effect
Mexican poppy (*Argemon mexicana*)	Dark green in colour, globose and netted; acts as a purgative, sedative or an emetic

Other impurities comprise seeds of cultivated crops such as oats, barley, peas, gram, maize, soyabeans, etc. and foreign matters like pieces of metals, thread, mud and stones.

CLEANING OF GRAINS

Cleaning devices for foodgrains must be based on differences in size, shape, specific gravity and air resistance of the different types of impurities. The following appliances are recommended for use on a small scale.

Supda: It is a small appliance made out of bamboo strips and has a base and ridges on three sides. It is worked by moving the grains up and down along its base, thus making it possible for the impurities which differ in their specific gravity and air resistance as compared to the grain, to separate.

Sieve: This is made from wire mesh having holes of uniform size and fixed to a wooden frame of any convenient size. For different grains meshes of different sizes are used.

Winnower: It is primarily a fan-blower, creating a blast of wind against which the grain is made to drop. In this way, the impurities having different air resistances are blown away. In some parts of the country, advantage is also taken of the blowing wind or a blast is caused by moving a piece of cloth.

Modern machinery is used where huge quantities of grains are to be cleaned. The principles employed in the working of the machinery are, however, the same as in the cases of the methods described above, and in its working a particular machine may be limited to one or more of these operations. The following mechanical appliances are recommended for this purpose:

Hopper sieve-stand: This is a device to regulate the flow of grains dropped from a high level, over a set of sationary sieves of suitable meshes. Thus it is possible to separate materials that are either bigger or smaller in size than the main grain. Six to eight persons with this device can clean 30-35 tons of grains in about eight hours.

Winnowing machine: This consists of a fan (worked either by hand or power) which blows air

through a regulated stream of dropping grain. Impurities having different air resistances such as insects, husk, bran, damaged grains, etc. can be easily removed by this method. These machines are available in different sizes. A manually-operated machine can clean eight to ten tons of grains in about eight hours and requires six to eight persons for operating it. If sieves are fixed to the part where the grains drop and accumulate, the appliance can also be made suitable for separating impurities differing in shapes, sizes and air resistances.

Power-cleaner: This machine combines the two major functions of cleaning, viz. blowing and aspiration, and is worked by power instead of manual labour. The machinery involves raising of the grains by an elevator, subjecting them to blowing or aspiration and thus removing the lighter impurities like small rigid weed seeds, husk, bran, etc. Aspiration is found to be more effective. The grain is then passed over a set of moving sieves, which help in further separation of impurities. This is followed by aspiration before delivery to the receptacles. A machine of this type can clean 40-60 tons of grains in about eight hours. A number of such sets could be worked at the same time, if so desired.

CONDITIONING OF GRAINS

Conditioning is defined as preparing the grain to make it fit for human consumption. The process of conditioning would differ according to the damage undergone by or spoilage present in the grains.

The factors responsible for apparent damages which are frequently met with and the suitable ways of conditioning the grains are mentioned below:

Damage due to heating: It has been observed that due to extra moisture acquired by the grains or due to insect activity, the temperature during storage rises considerably, thus enabling the fungi to grow. In the initial stage, the fungal growth is superficial and gives only a whitish, yellowish or greenish appearance to the grain. Grains thus damaged could be conditioned and made acceptable. When, however, the grains develop black colour, no amount of conditioning will restore the original appearance. Grains stored in bins, gunny bags, ill-ventilated rooms or stored underground usually undergo this type of damage. In the former case, the damaged grains may be spread in thin layers to the open air and sun to allow cooling and drying. Alternatively, mechanical dryers may be used. Thereafter, the grains may be polished in a mill or pounded by hand to remove the superficial fungal growth.

Colour damage: When grains are damaged in transit by non-poisonous powders such as charcoal powder, chalk powder, etc. the damage is only superficial and may be removed by washing the grains with water. Polishing may be done, if necessary.

Insect damage: Due to ravages of insects the grains may contain an appreciable proportion of hollow elements or they may be lumped together. In either case the grains are unacceptable for human consumption. In such cases the grains may be passed through a winnower or an aspirator of the power-cleaning plant so as to separate the hollow elements. The grains may then be pounded to break the lumps and finally cleaned on sieves.

Moisture damage: Some grains may get damaged by water during transit or due to leakage in the warehouses. In the early stages of the damage the grains may be made acceptable, but if the damage becomes more pronounced or the grains germinate or blacken due to growth of molds, they become unfit for human consumption.

The damaged grains should be isolated from the undamaged grains, dried in the sun and consumed immediately. In the case of rice, however, the grains should always be dried in the shade, otherwise they may break into small pieces.

★

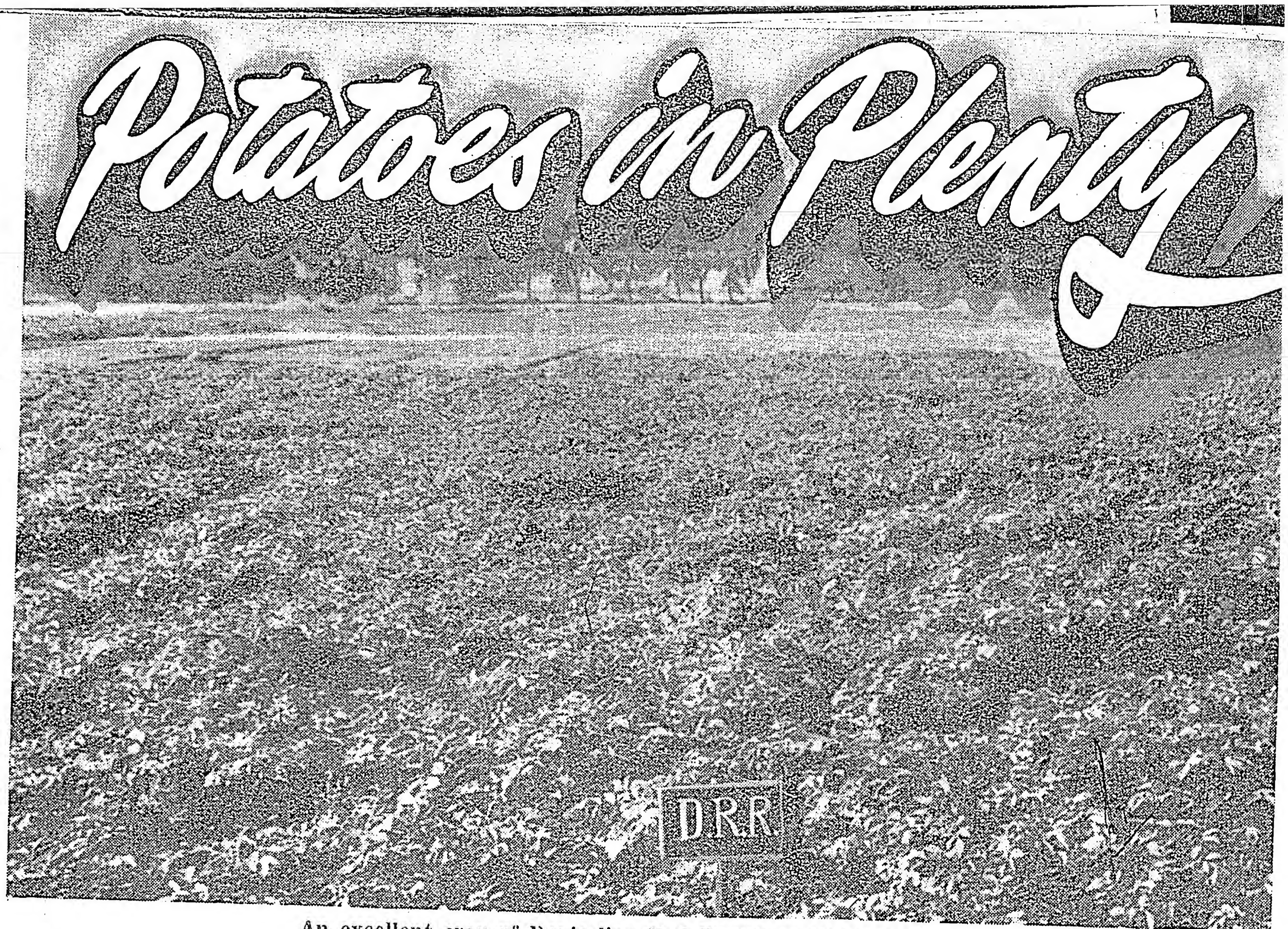
ERRATA

Indian Farming, May, 1953 issue

Page 29, line 14 from above (item No. 3 under Tips for Better Breeding).

For 12-20 days
Read 19-20 days

Potatoes in Plenty



An excellent crop of Darjeeling Red Round at the I. A. R. I.

By R. D. VERMA

ANY practice which leads to lowering the cost of production or helps to increase the yield, will be of great practical importance to the farmer.

In this article are given some useful hints, based on the experimental findings and practical experience gained in the growing of potato crop in the Division of Agronomy, Indian Agricultural Research Institute, New Delhi, which will, it is felt, help the farmer to get higher yields at lower cost.

SIZE AND THE SPACING OF SEED TUBERS

Size of the seed tuber, spacing of the rows, and the spacing of the tubers in the row have a profound influence, not only on the yield and grades in the produce, but also on the quantity of seed required to sow a particular area. As seed is, generally, a costly item, higher seed requirements mean greatly increased cost of production. The objective, therefore, must be to use the smallest quantity of seed, commensurate with the aim of getting the maximum net returns. ✓

Size of the seed : It needs hardly to be emphasized that seed must be sound and of uniform size to ensure good germination. Poor and gappy germination due to faulty seed tubers will always give lower yields. In addition, the use of proper size of the seed is also important for economy in the seed requirements. Slight variations in the seed size greatly alter the seed requirements. For example, if the seed size is increased from ¾ in. to 1 in. diameter to 1¼ in. to 1½ in. diameter, the seed requirements shoot up to almost four times. On the other hand, too small a seed size results in lower yield.

Experiments conducted in the Division of Agronomy, Indian Agricultural Research Institute, have shown that the most suitable size for a variety like Phulwa is between 1 in. and 1¼ in. diameter. It will be of interest to know that, generally, the bigger the size of the seed tuber, the lower is the percentage of large-sized tubers in the produce. This behaviour can be very profitably utilized. If, for example, the crop is being grown for seed purposes, where big-sized tubers are not required, seed tubers of bigger size should be used; while, if we wish to obtain greater percentage of big-sized tubers in the produce, seed tubers of comparatively smaller size should be planted.

Row-spacing : Spacing of the rows also alters the requirements of seed and affects the yield. If the rows are spaced too close, the requirements of seed tubers greatly increase; if, on the other hand, spacing is too wide, the yield is greatly reduced. When deciding on the spacing between the rows, the variety grown must also be taken into consideration. For the varieties like Phulwa, whose stolons spread out quite considerably, wider spacing will obviously be necessary, than in the case of a variety like Up-to-date (Simla Special) where the tubers are formed close to the stem. Experiments have shown that for the former

type of varieties, a space of 2 ft. between the rows is optimum, while for the latter varieties, 1½ ft. is the most suitable distance. The temptation to plant too close must also be resisted on other important considerations. For instance, in too closely spaced rows, operations like hoeing, earthing up, etc., are not possible by bullock-drawn implements, and thus the cost of these operations undertaken by manual labour will greatly increase the production cost.

Spacing between the tubers in the row : Tuber spacing in individual rows, influences both the economy in the use of seed and the ultimate yield. Too close or too wide a spacing both depress the yield, former by inducing unhealthy competition between the plants, and the latter because of sparse population. Experiments have conclusively shown that nine-inch spacing is the most suitable both from the point of view of yield and net returns. However, as in the case of row spacing, in seed spacing too some adjustments are necessary according to the variety grown. In the varieties where the tubers are formed close to the main stem, closer spacing may be practised.

MANURING

Potato crop has high manurial requirements, specially in the early stages of growth. Of the three main manurial constituents namely, nitrogen, phosphorus and potash, experiments in this Institute have shown, that nitrogen is the most important. One hundred and twenty pounds of nitrogen per acre (600 lb. ammonium sulphate) greatly increased the yield and proved economical as compared to the lower doses; 60 lb. of P_2O_5 (150 lb. triple superphosphate) was found to meet the normal requirements, while application of potash led to no increase in yield. This is, because the Indian soils are generally deficient in nitrogen and rich in potash. In addition, farmyard manure at the rate of 250 maunds or more per acre may also be ploughed in six to eight weeks before sowing to provide steady supply of nutrients to the plants.

The results of experiments in this Institute and in other countries show that it is far better to apply all the fertilizers at the time of sowing than applying them at a later stage. An experiment conducted in this Institute to compare the application of the whole dose of fertilizer at the time of sowing as against fractional application showed that application of the whole of the fertilizer at the time of sowing increased the yield by 16 per cent and 52 per cent as compared to other two treatments of (1) application of 1/2 dose at sowing and 1/2 at first earthing and (2) 1/3 at sowing, 1/3 at first earthing, 1/3 at second earthing, respectively. This is because the tuber development greatly depends on the vegetative growth of the plant, and if the plant is given a good start by providing ample nutrients in the beginning to ensure the vegetative growth required, the result is that both tuber formation and development are beneficially affected.

APPLYING FERTILIZERS

In order to meet the high manurial requirements of the potato crop, it is necessary that the available manures be applied in such a position in relation to

(*Contd. on page 27*)

LAND AND IRRIGATION

By R. V. TAMHANE
Indian Agricultural Research Institute, New Delhi

IRRIGATION is very essential to profitable production of most crops where rainfall is inadequate or erratic and also where the annual rainfall is more than the quantity required by the crop but where long periods of drought intervene between the precipitations. Whenever the growth of a crop is limited by a shortage of moisture even for a comparatively short time, irrigation properly applied increases its growth. Irrigation practices in India, so far as the use of water is concerned, are often injudicious and extensive areas of land have become either saline or water-logged in many parts as a result of irrigation.

PHYSICAL PROPERTIES

Almost any land can be irrigated provided the land surface is not too steep and too rough. The ideal soil for irrigation, however, is a deep, fertile, fine sandy loam with excellent surface and sub-surface drainage. If the soil is sandy or shallow and lies on a sand or gravel subsoil, it will be difficult to spread evenly irrigation water over the surface without the danger of over-irrigation. When more water is added than the soil can hold, seepage with all its dangers begins. More frequent irrigations resulting in increased cost of water, labour, and money will be required for shallow soils than for deep ones. On the other hand, tight clays and silty clays are difficult to irrigate because of the slow rate at which they absorb water and thus affect the subsoil drainage.

Soils with impeded drainage are likely to result in water-logging. Similarly, in some areas the problem of soil alkali must always be considered, as large areas of soil contain excessive quantities of soluble salt which may reduce yields of crops or in extreme cases entirely prevent their growth. Soils which are impermeable cannot be leached of salt. Thus the problem of subsoil drainage assumes great importance in heavy soils. Similarly, irrigated land that has a high water table is most likely to suffer from salinity. Soils of moderate texture and high water-holding capacity are specially favourable for irrigation because they permit easy application of water not very frequently with good resultant crops. In short the physical condition of the soil is one of the chief factors which has to be studied in an irrigation project.

FERTILITY

Fertility of irrigated soil is also of great importance for three reasons. Farming under irrigation is relatively expensive and high yields are necessary for profitable results. Under good irrigation practice water is not the limiting factor and in this condition crops on a fertile soil will naturally produce correspondingly high yields. The use of water per unit of crop yield is less for fertile soil than that for a soil not so fertile. This difference is significant and measured in units of water it may ultimately mean a considerable wastage or economy of water required for crop production under irrigation depending on the type of soil selected. A project with fertile soil will thus require less water for a given amount of crop production or permit a large production with the given amount of water. Thus land productivity in many cases determines the value of a project.

The area commanded by the Chambal-Hydel Project of Rajasthan has been known to be fertile in the past. This area has also not been affected by famine conditions. It is known to produce grains sufficient for local consumption. The population is almost entirely devoted to agriculture. On account of uncertain rains, however, intensive cultivation is not practised. There is thus a great possibility of increasing production with an assured supply of water. If waters from the river Chambal and from the catchment area of Bundi hills and Mukundwara ranges could be retained by means of a reservoir as has been proposed in the project, and made available for irrigation in the plains, large areas now subjected to permanent or frequent droughts could be converted into rich and fertile arable land.

CHAMBAL PROJECT—A SOIL SURVEY

During the course of the soil survey of the area covered by Chambal-Hydel Project, it was apparent that nearly 30 per cent of the land was permanently unproductive due to severe erosion. Approximately 300,000 acres of land are affected as a result of gully erosion. There are also areas affected by more or less moderate degree of erosion. Erosion is severe in areas especially near the river beds. The river beds have been cut down to a depth of nearly 20 to 30 ft. and these have assumed the form of U-shaped gullies. There are also considerable temporarily unproductive areas; these require levelling and adoption of suitable erosion control measures. The land in the project area unaffected by erosion of any kind is very productive.

The soils of the commanded area are very deep and clayey to clay loam but the subsoils are heavy, and it is necessary that the problem of drainage should be properly considered in the early stages of the project. The soluble salts in these soils are much below the injurious limit and there is no immediate danger of development of alkalinity under perennial irrigation. The lime reserve is enough to maintain the desired physical condition of the soil. The lands under the present project have no doubt the potentiality for higher production, but there seems to be lurking a potent danger of their being permanently damaged by erosion. Special attention should be paid to this problem which, if neglected in the early stages of the project, may assume serious proportions. Since the commanded area is a catchment basin with five rivers draining it, control measures

(*Contd. on page 29*)

like white dots on the surface of the grains and are usually glued on to the epidermis. The eggs hatch out in four to five days and the tiny yellowish grub that hatches out of the egg burrows into the grain. The entrance hole is so minute that it escapes the notice unless one's eyes are trained to spot damages of this kind. The larvae go on feeding inside the grain without any outside indication and the grain apparently looks healthy. The larvae are full-grown in about three weeks in summer. During this period the larva has consumed a fairly good proportion of the grain from inside and then forms adroitly a tunnel that leads to the circular exit hole. The larva pupates at this stage inside the tunnel in a curved state. The pupal period usually lasts from three to four days during summer. This period is considerably longer during winter. The adults when they emerge push through the exit holes thoughtfully formed in the larval stage. If undisturbed the adults remain on the top of the grains. Mating then follows and yet another cycle is started afresh. This pest has a number of generations in a year governed by the twin ecological factors of temperature and humidity.

SITOTROGA CEREALELLA

This species is commonly known as the Angoumois grain moth and is one of the most destructive pests of unmilled grain. It is cosmopolitan in distribution and is found all over the world. It is not uncommon to see small buff coloured moths flying or crawling on the surface of bags or bins filled with grains in granaries and godowns. One or two minute holes are present in the samples of grains infested by this pest. As a rule greater damage occurs on the upper surface of grains in bags or bins. It is oftentimes difficult to detect this pest in early stages of its infestation as the damage occurs inside the grains. When only the moths emerge in large numbers from the pupae that are formed inside the grains, we realise that the grain has been infested by this pest. The adult moth is very delicate and measures about half inch with the wings expanded. They mate soon after emergence and the female moth lays several hundred minute white eggs. A maximum of 400 eggs has been observed to have been laid by a single female. Eggs are laid singly or in clusters and are usually deposited in depressions, cracks or holes in the grain or sometimes amidst the grain. Each egg measures about 0.5 mm. long with both ends rounded. The egg hatches in about one week and the tiny worm-like larva at once burrows into the kernel of the grain and feeds on the kernel. The larva feeds thus for about two to three weeks until it pupates inside the grain under a silken cocoon. The pupa is brown in colour. Moths emerge from these pupae in about a week. The pest is very susceptible to cold weather conditions and die in large numbers or become benumbed during the winter months. Breeding is continuous throughout the year when warmth and other favourable conditions prevail. At least four broods have been observed in our country.

CORCYRA CEPHALONICA

This pest is commonly known as the rice moth and is a serious pest of stored paddy, rice and other cereals. It has been reported from almost all parts of the world. This moth is comparatively bigger in size as compared to *S. cerealella*. This pest thrives well only on broken foodgrains and this applies more in the case of the tiny larvae that hatch from the eggs. The full fed larvae can to a certain extent bore their way into the whole grain. The female moth within a couple of days of its mating lays eggs amidst the grains. A single female has been observed to lay a maximum of 200 eggs. As in the case of the grain moth, eggs are laid on bags, walls or among grains, either singly or in small clusters. The egg is white in colour and oval-shaped and each measures 0.5 mm. long and 0.3 mm. broad. The egg hatches in four to five days. The tiny larva is creamy white in colour and moves about actively and feeds on the broken grains. When full-fed the larva spins a tough silken cocoon inside which it pupates. The pupa is of light brown colour. The larval period lasts about a month. Moths begin to emerge from the pupae after about ten days and the cycle is repeated.

CONTROL MEASURES

There is a popular myth that the infestation of stored grains by insect pests cannot be avoided. This is a fallacy which cannot stand a moment's scrutiny.

Insects multiply in the artificial conditions that we ourselves create for them. In the case of insect pests of storage early neglect is fatal, for neglect makes multiplication easy. It is a well known scientific fact that the development of the insect pests of stored grains depends on the water content of the foodgrains. Dryness which is an essential factor for preserving the quality of foodgrains is unfavourable for the growth and multiplication of insect pests of stored grains. So it is extremely necessary that we should see that the grains are well-dried before they are stored in bins. It is also essential that there should be no initial infestation. In a country like India where solar energy is both bounteous and plentiful at all times it can be utilised for drying grains soon after harvest and before their storage. If to this we can give a light fumigation by any of the fumigants like carbon disulphide or Chlorosol, infestation can be completely avoided.

There is danger of infestation from July to October and it is during this period that we have to be very careful. A number of fumigants are available in the market but the most effective and harmless from the point of view of the viability of the grains intended for seed purposes is the fumigant sold under the name of Chlorosol, which is a mixture of three parts of ethylene dichloride and one part of carbon tetrachloride. The mixture is obtained in a liquid form but vaporises on exposure to air. All that is to be done is to cover up the infested grains under an air-proof cloth and pour this compound on a shallow dish on the top of the grain at the rate of about 4 lb. per 100 maunds of the grain. The exposure period is 24 hours. Fumigation of grains intended for food can be carried out with carbon disulphide, methyl bromide, hydrocyanic acid gas, etc. But

these fumigants can only be handled by the dexterous hands of a well-trained entomologist. So it is recommended that Chlorosol is the safest fumigant to use.

For storage of grains meant for seed purposes, dressing of the seed grains by 10 per cent DDT dust at the rate of 2 oz. per 125 lb. of grain will give very satisfactory results. Researches carried out in the Division of Entomology at the Indian Agricultural Research Institute have shown that treatment of the seed grains by 10 per cent DDT dust does not affect the viability of seeds at all. Moreover, it keeps the seed grains free from the attack of insect pests. Pyrethrum is a harmless insecticide and its use to prevent infestation of both food and seed grains can be safely recommended. But unfortunately the insecticide is expensive today. When Pyrethrum flowers are grown in larger quantities and the extraction of the insecticide standardized, this insecticide will be a boon not only for the control of insect pests of storage but pests of agricultural crops in general. For we shall then be handling an insecticide non-toxic to warm-blooded animals and human beings but highly lethal to insect pests.

POTATOES IN PLENTY - - - - - - (*Contd. from page 23*)

the seed tubers, that the plant is able to utilize them fully and quickly. Experiments conducted at this Institute and in foreign countries have conclusively shown that this object is best achieved by placing the readily soluble nitrogenous fertilizers in bands on both sides of the seed tubers, 2-2½ inches to the side and one inch below the plane of tubers. The phosphatic fertilizers, on the other hand, should be applied nearer to the tuber in a single row directly beneath them. This very efficient method of use of fertilizers could not so far be practised by the ordinary cultivators who could not afford expensive machines devised for this purpose in foreign countries. But it has been shown that placement of fertilizers can be most easily and efficiently done by means of a horse-hoe by adding a few simple attachments to it.

Briefly, three U-shaped iron plates are screwed between the tines and the frame of the horse-hoe. These plates keep the furrows open, while the fertilizer is dropped in position through *poras* or metal tubes attached to these plates. This simple device has been fully illustrated and explained elsewhere.* So also the advantages of placement method of fertilizer application have been fully discussed.†

TIME AND METHOD OF SOWING

In the potato crop, sowing at the right time assumes greater importance, because, if the tubers are planted too early in the season, when the temperatures are still high, they are liable to rot in the soil, resulting in poor germination; on the contrary, late sowing reduces the yield as well as the size of the tuber by not allowing sufficient period for the crop to grow, and the tubers to attain their maximum size. For the Phulwa variety, a period of about 150 days is the minimum for the crop to mature. Early-maturing varieties will require less time. In areas where similar climatic conditions prevail as in Delhi, to obtain big-sized tubers, crop should be sown about 15 October, but for seed purposes, it will be advantageous to sow the crop in the first week of November.

Method of sowing is also important from the point of view of the cost involved. The common practice of sowing on ridges is laborious and expensive. It offers no particular advantage except possibly in case of insufficient moisture in the soil after planting, in which case it is possible to irrigate the crop to help germination without water coming in contact with the tubers. Flat sowing gives as good a germination as ridge sowing, if there is adequate moisture in the soil at the time of planting. Planting is done simply by opening the furrows with a country plough or with a horse-hoe, if fertilizers are being applied by the placement method, and then covering over by one or two light plantings. Care, however, should be taken to keep the spacing between the rows at proper and uniform distances, the furrows straight and 3½ to 4 ins. deep. The tubers in the furrows should be firmly pressed into the soil. It is advisable to put pegs in the ground at measured distances to help the ploughman open the furrow at appropriate places. Irregular spacing and curved or

(*Contd. on page 29*)

* "A simple device for the placement of fertilizers", *Indian Farming*, July, 1952.

† "How to get the maximum benefit from the application of fertilizers", *Indian Farming*, October, 1952.


there's a
DUNLOP TYRE
for every
farming job
TRADE MARK
A new cover deserves a new Dunlop tube
DTX 6

POTATOES IN PLENTY

(Contd. from page 27)

crooked furrows will make inter-cultivation and earthing-up with bullock implements difficult later on.

INTER-ROW CULTIVATION AND EARTHING-UP

Giving even one or two hoeings by manual labour, as is generally the practice with our cultivators, adds considerably to the cost of production. These hoeings can be done very cheaply, and more frequently with a horse-hoe or bullock cultivator, if flat sowing has been resorted to, the spacing between the rows has been properly maintained and the rows are not too closely spaced. Horse-hoes of good makes are provided with hilling or ridging attachments by manufacturers, and they are quite suitable for doing this job. If heavier earthing up is required, as, for example, in the Phulwa variety, ridger plough can be very effectively used. It does very uniform and deep earthing-up. With a horse-hoe 2½ to 3 acres can be hoed quite comfortably per day. The cost, therefore, will be only a fraction of doing the same operation by manual labour. One precaution, however, will have to be taken, that is, to ensure that the bullocks walk in between the rows and do not trample the crop. This is ensured by using longer and adjustable yokes, in which the distance between the bullocks can be varied.

Earthing-up should be done at the right stage. If the plants are too small, they are liable to be buried under the soil if earthing-up is undertaken too early; if on the other hand, it is delayed too long, some of the shoots which have grown long, may be damaged in the process. It is generally desirable to do the first earthing-up with a horse-hoe and the second by a ridger plough.

DISEASES, PESTS AND THEIR CONTROL

Potato yields are often greatly reduced because of the virus diseases. Rolling, curling, blotching with consequent stunting of the plant are the symptoms of various diseases caused by virus. Unless adequate control measures are taken, potato production may become uneconomical in spite of the best efforts in other directions. Proper control measures would help to check the diseases.

Use disease-free seed : As the virus diseases are spread from the few diseased plants which may come up from infected tubers, seeds from hilly or other regions free from virus diseases should be preferred. It may not, however, be possible to get fresh stocks of disease-free seeds from these regions every year, but efforts should be made to secure supplies every second or third year, at least for seed multiplication.

When multiplying seed on a farm, a suitable area, some distance away from the rest of the crop should also be planted. This plot should be regularly and thoroughly examined and any plants showing signs of the disease should be dug out along with the tubers and immediately destroyed. The healthy plants should not be touched with the contaminated hands. Seeds from a disease-free crop may thus be obtained. To spot the diseased plants and give a thorough rogueing, is really a trained person's job. Help of the local representative of the Agricultural Department should be sought in this important work.

Other common and serious disease of the potato crop is early and late blight. Spraying with fungicides like Perenox will greatly help to ward off the disease. Agricultural Departments of most of the States have staff who undertake spraying; the cost is usually negligible.

Of the pests, the most serious one is the white fly. This minute insect is mainly responsible for spread of virus diseases. Spraying with any insecticide or fungicide will kill these insects. The Agricultural Department should be consulted about the particular fungicide or insecticide, its strength, and the method of its use.

LAND AND IRRIGATION

(Contd. from page 24)

of erosion at the watershed are especially important.

A knowledge of seepage loss from canals and the drainage conditions will be the guiding factors in formulating the cropping-system. In low-lying areas outlets for excess of water during monsoon are an absolute necessity. There is a possibility of water-logging of low-lying areas. This will have to be prevented by opening up suitable drains and such lands may have to put under paddy cultivation. Since erosion is extensive, the crops should be selected very carefully so as not to encourage further losses of soil. Those crops which require less amount of water may be selected. A crop like sugarcane which needs about 90-100 acre inches of water for its successful growth is liable to cause increased seepage of water to the low-lying areas which are likely to develop water-logging in course of time if not properly protected. In Bombay-Deccan, canal irrigation of sugarcane crop has damaged considerable areas of low land in this way.

Erosion control measures in low lands will have to be initiated on scientific lines and the programme of embankment will have to be taken in conjunction with the alignment of the distributaries.

It is needless to say that water for irrigation purposes should be so controlled that the amount available is sufficient to meet the needs of crops. The quality of water in this area as judged from the analysis does not indicate any inherent danger of salinity. On the other hand rivers flowing through lime beds will carry enough lime and will maintain good physical condition of the soil.

Under an irrigation project it is essential that there should be sufficient land to use all the water stored in the reservoir. Further the fertility of the land must be of order to ensure a yield which will leave sufficient profit to the farmer after the cost of production has been met.

20 YEARS OF SELECTIVE CATTLE BREEDING WORK OF CENTRAL DAIRY RESEARCH INSTITUTE

(*Contd. from page 17*)

RESEARCH

The research and other activities of the Institute are carried out in four sections, dairy husbandry, dairy technology, dairy chemistry and dairy bacteriology.

The *Dairy Husbandry Section* deals with the breeding, feeding and management of dairy cattle. The Institute maintains for its breeding and feeding experiments a dairy herd of about 300 cattle, including the Red Sindhi, Gir and Tharparkar breeds of cows and the Murrah buffaloes.

Back away in 1933, was started a systematic breeding of the Red Sindhi cattle. The efforts of the past two decades are seen in the considerable increase in milk production, and the number of championship prizes won by this Institute's Red Sindhis. The average daily yield of milk now is 13.7 lb. and the highest yield 7,128 lb. in a lactation period of 300 days. The males are sold to the States of Coorg, Mysore, Bengal and Madras and the increasing demand for cows can be met only partially. Requests for animals come from many South East Asian countries, notably from Thailand, Vietnam and Malaya.

The number of Gir cattle, which combines the qualities of a good milker and a good draft animal, is 59. The average daily yield is 12.5 lb. and the highest yield 5,160 lb. in a lactation period.

About nine years ago, 35 surplus cattle of Tharparkar breed were received from the Karnal farm. The present average daily yield is 13.4 lb. and the highest yield 4,808 lb. in a lactation period. For the Murrah buffaloes the corresponding figures of milk yield are 13.4 lb. and 5,239 lb. respectively.

As I walked across the enclosure reserved for the Institute's cattle, I noticed a cow shed erected "to the memory of 'Jill', who during her life of 20 years had 18 calves and yielded 1,54,779 lb. of milk." Truly a record I thought, and well worth recognition in this novel manner.

For four years, the Institute has been experimenting on using Red Sindhi cows for ploughing the fields and the observations made so far indicate that there is no harm in using cows for light work in the fields. This opens up new possibilities for the Indian farmer and his cattle.

India produces only two-thirds of the requirements of fodder. Any increase in the production of fodder would help augment the country's milk supply. The Institute is, therefore, experimenting with a large number of indigenous and foreign grasses to see how far they can be adapted to local soils and climate. In other directions also, the emphasis is on better and more economic feed for cattle.

The *Dairy Technology Section* deals with the problems of handling, processing, transport and distribution of milk and manufacture of milk products on a large scale. Two improvements evolved after long research are of particular interest to urban consumers of milk. One is a new technique of milk collection-*cum*-processing for its transport over long distances, and the other a tamper-proof can for milk distribution.

The other investigations carried out in the Technology Section have yielded technical data of considerable practical importance to the dairy trade, in connection with the manufacture and storage of milk products like butter, *ghee, khoa* and *chhana* and the economic utilization of skim milk and other by-products for the preparation of industrial products or supplementary foods.

The *Bacteriology Section* is interested in clean milk production, its processing and the preservation of milk and milk products from spoilage by micro-organisms. A new method of detecting bacterial contamination in milk has been developed, according to which unclean milk is rapidly turned into a deep red liquid. Another experiment which should be more widely known in the trade and among housewives in India is the preparation of "starters" containing useful bacteria that can guarantee good standard quality *dahi*, butter or cheese. Some bacteria produce large amounts of acids that give sour *dahi*, others produce smaller amounts which give us sweet *dahi*. A few other species of bacteria produce volatile flavour compounds which enhance the palatability of curds. The *dahi*- "starters" used "according to instructions" will give housewives the quality of their choice! Experiments are also in progress to prepare these "starters" in the form of small white tablets for easy distribution and handling.

The *Dairy Chemistry Section* deals among other things with the chemical analysis of milk and its products, detection of adulteration of milk and milk products. A simple method capable of application in average Indian homes, has been evolved for removing the high acidity of bazaar *ghee* by the use of lime. Experiments have also shown that the best method of keeping *ghee* is to store it in tin, aluminium or porcelain containers "full to brim" with good lids and with as little air gap as possible.

A large amount of data of wide practical application, regarding the chemical composition and vitamin contents of milk of different species, and the influence of feeding and other factors on the composition of milk and *ghee* made from it, have been collected. It has been found that the nutritional deficiencies of the typical rice diets of the Indian population can be overcome by the addition of 10 oz. of milk (or an equivalent amount of *khoa, dahi, chhana* or *kheer*) per day in the usual diet.

EXTENSION WORK

Not only does the Indian Dairy Research Institute do its bit for adding to the country's grain resources — last year it handed over about 9,900 seers of *ragi* to the food authorities of the Mysore Government—but it has now also started extension work on a small scale. A Key Farm Centre organized by the Institute provides (1) facilities for artificial insemination of cattle, (2) bulls in village areas for natural service, (3) long distance transport of semen and (4) general aid to villagers in regard to cattle management and control of disease. A group of 24 villages has been selected for intensive work within a five to ten mile radius of the Institute. In less than six months of its inception, the centre has completed more than 2,000 artificial inseminations. Consignments of semen of Sindhi bulls are being flown from the Research Institute to Cochin, Trivandrum and Bhuvaneshwar with considerable success.

LOOK OUT FOR NEW HABITATION

The course of true research never did run smooth, for the Indian Dairy Research Institute is now on the look out for a new habitation. The present 100 and odd acres now in its possession, is too small an area for an expanding organization and no more land is available in Bangalore, despite all efforts. Explaining the position, Dr. K. C. Sen, the Director told me that a minimum of 500 acres of good farm land was essential for cattle grazing and fodder production. "Without this India cannot raise a sufficient number of good quality cattle, the demand for which is insatiable."

Dr. Sen sees great potentialities in the development of the Red Sindhi cattle not only for home use but for sale to foreign countries. "Three thousand animals is not an impossible target" he told me. Pressed for more details, he said four or five centres could be started in different parts of India for the breeding of this type of animal. In his opinion the location of the centres might advantageously be round about Delhi, Bangalore, on the Bihar-Bengal border and in Orissa. Some work had already started in the last place.

I asked Dr. Sen one final question, as I rose to go. What was the ideal location for the Research Institute under his charge? "The matter is being examined by an expert committee and I do not want to anticipate their findings. All that we need are 500 acres of good land, where we can carry on our researches and experiments undisturbed without the threat of moving out every 20 years. The Institute should be located not too far from a University Centre where researches on agricultural and other allied subjects are being carried out and there is a suitable library to assist us in our work." A reasonable demand, I agreed.

INDIAN FARMING

Vol. III New Series No. 8 Nov. 1953

EDITOR'S PAGE AND EDITORIAL NOTES 2
MAN OF THE MONTH (Feature Article)—A. R. Vyas 4
THE MUSTARD SAW-FLY, ATHALIA PROXIMA KLUG—E. S. Narayanan 8
BILVA OR BEL (A. MARMELOS) —B. L. Choudhri 10
GOAT BREEDING IN ASSAM —D. L. Paul 12
WEALTH FROM TOBACCO WASTES —M. S. Patel and A. N. Srivastava 14
MENACE OF ADHASIS —S. M. Wakankar 16
AGMARK SANN HEMP GRADING IN INDIA—Partap Singh 18
EXTENSION PILOT PROJECT MALAVALLI—Hans E. Kardel .. 20
GOVERNMENT EXTENSION TRAINING CENTRE, ANTRI 24
CARE AND MANAGEMENT OF LAMBS —S. Jayaraman and B. B. Buch .. 26
LOOSE-BOX METHOD OF COMPOST MAKING—R. Speck 29

★

EDITORIAL BOARD

Printed and published by P. H. Raman at the Associated Advertisers and Printers Ltd., 505, Arthur Road, Tardeo, Bombay 7.

(Agents for Indian Council of Agricultural Research, New Delhi.)

ADVERTISEMENT RATES

CURRENT:
CASUAL

Full Page	Rs. 450/-
1/2 Page	Rs. 225/-
1/3 Page	Rs. 150/-

CONTRACT CONCESSIONS:

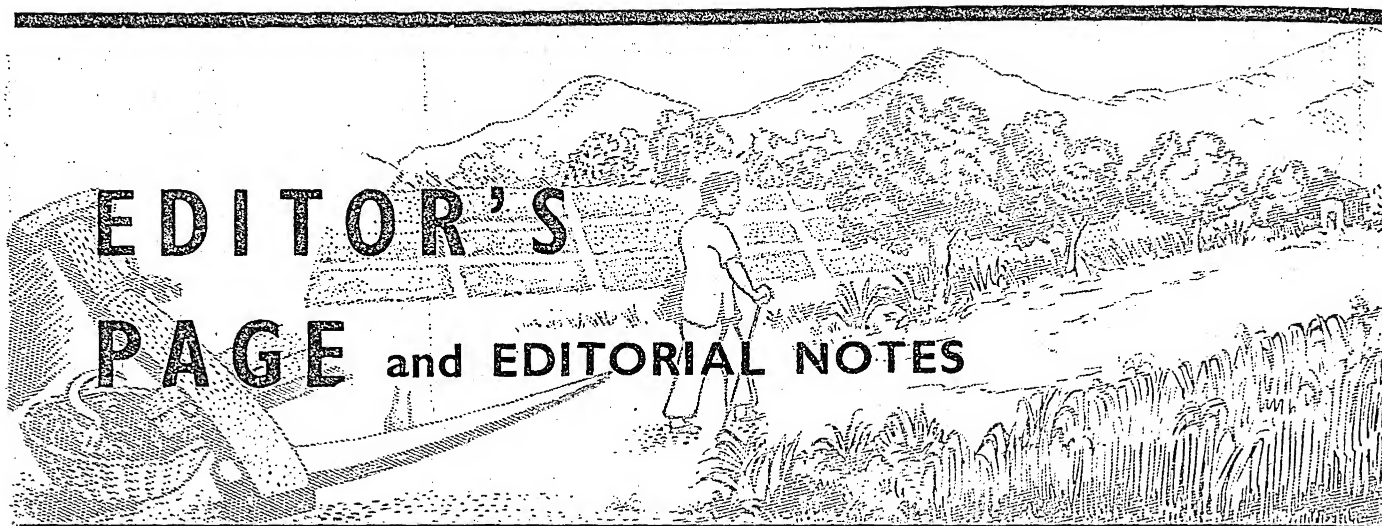
6 INSERTIONS	12 INSERTIONS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

Effective from October 1952 until further notice.

SUBSCRIPTION RATES

Annas 12 only per copy
Rs. 9-0-0 for 12 issues
Rs. 4-8-0 for 6 issues

All Business enquiries may be addressed to the "Agents" at 505, Arthur Road, Tardeo, Bombay 7.



EDITOR'S PAGE and EDITORIAL NOTES

In the wake of the Conference of the State Directors and Ministers of Agriculture comes another equally important workshop dealing with the vital problem of agricultural marketing. That this aspect of our agricultural economy has not had the same attention as paid to all the other phases in the recent years, has become painfully evident of late and this conference has not come a moment too soon.

As stated by the Union Minister for Agriculture in his speech, attempts at developing marketing of agricultural produce have all an atmosphere of isolation from the rural community, as it often appears to be an attempt to impose things from above. No structure which is not based on the cooperation of the parties concerned can be durable or be expected to stand by itself.

In respect of this phase of agriculture, the inclination has been to take the primary producer for granted and a reorientation of administrative and executive approach to agricultural marketing is to be accorded priority and unless this is done, very little progress will be registered in the coming years as well.

The discussion in the conference spot-lighted the need for building up a strong cooperative organization for improving marketing facilities in the country and the recommendations made by the conference show increasing awareness of the need for taking more active interest in this work. An interesting sidelight is a new angle from which the Minister treated this problem at a time when employment possibilities are being considered by the Planning Commission. It is clear that except in its later stages in some cases, marketing appears to suit the aptitude of only a certain section of our people. Our intelligentsia may also find this field of economic activity interesting enough if the action on strengthening marketing procedures and its reorganization is taken up. As the recommendations of this conference are implemented, we will soon have a programme which will be fitted into the National Extension Service.

PRIMARY PRODUCE

In order to secure to the primary producer adequate return for his produce commensurate with quality and ensure to the consumer products of guaranteed quality, the conference suggested that:

(1) The State Governments make special efforts to popularize the grading of all agricultural products for which 'Agmark' specifications have been laid down.

(2) The State Governments give effect to the proposals made by the Planning Commission in regard to the grading of *ghee* and edible vegetable oils under 'Agmark' and encourage their consumption by restricting inter-State movements only to graded produce.

(3) Regional and seasonal specifications for *ghee* be prescribed by the Agricultural Marketing Adviser to the Government of India wherever necessary.

(4) All Governments, Government-sponsored and aided institutions confine their purchases to 'Agmark' *ghee* and oils.

It asked the Directorate of Marketing and Inspection to explore possibilities of introducing grade standards for various fruit products, and urged the State Governments to encourage the promotion of the fruit products industry in the producing areas.

COOPERATIVES

In order to secure to the producer the maximum return for his produce, it urged the State Governments to (a) organize more marketing cooperatives at all levels and link them with credit and multi-purpose institutions; (b) encourage such cooperatives to provide facilities for the transport, processing and grading of produce; and (c) bring about closer liaison between the Marketing and Cooperative Departments of the States.

In addition, it was recommended that the Indian Council of Agricultural Research be moved to sanction a scheme for training in the marketing of agricultural commodities under the auspices of the Directorate of Marketing and Inspection. It also suggested that if a permanent organization is envisaged, both in the States and at the Central level, it should be staffed by trained personnel only. To do this, immediate and long range training programmes will be necessary, and the suggestion made for arrangements to be made by the Central and State Governments to train their marketing staff abroad and to the Universities to institute post-graduate courses providing for practical and theoretical studies in the marketing of agricultural and animal husbandry products, is very sound. The conference also touched questions of the standardization of weights and measures and of initiating research to evolve suitable containers for different types of perishable products such as fruit and vegetables, honey, fish, eggs, *gur*, etc. Effective implementation of this problem is bound to change any marketing system to the advantage of the primary producer.

OUR COVER

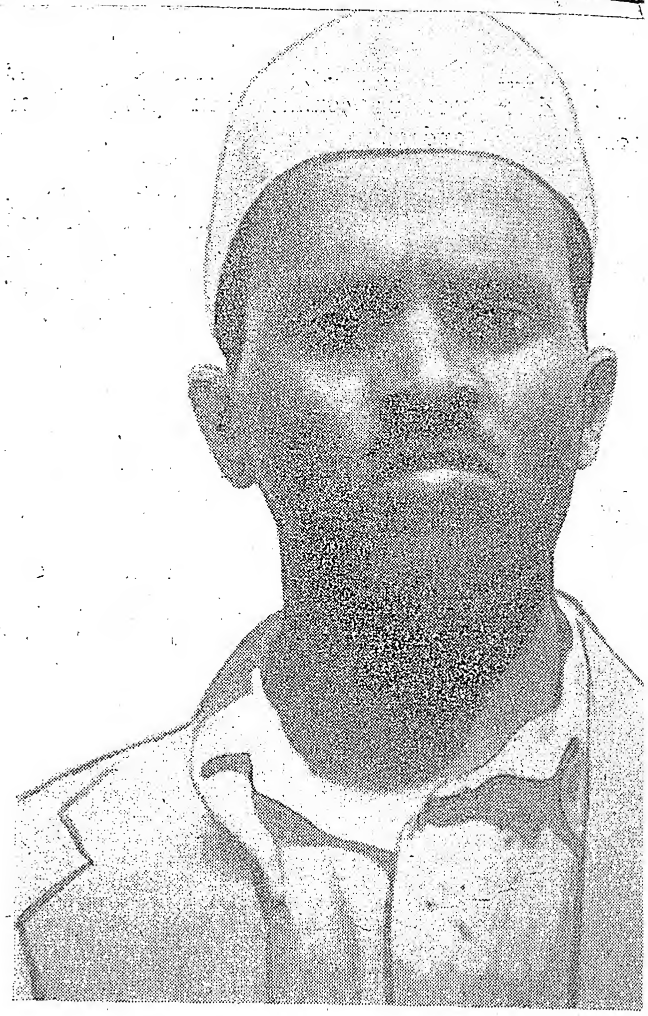
WATER LIFT

Oxen drawing well water for irrigation. As the oxen run down the slope the bucket comes to the surface and the water pours into the small irrigation channel. In this type of well the oxen must climb backwards up the slope to the well-head and they have to be specially trained for the job

MAN OF THE MONTH:

NASIK FARMER BECOMES NATIONAL HERO

By A. R. VYAS



Shri Laxman Gopal Mali

THIRTYFIVE-YEAR old Shri Laxman Gopal Mali, a farmer of village Shivre in Nasik district, is now a national hero, for he holds the world record for the highest yield of 16,611 lb. of paddy per acre. This phenomenal yield raised in the *kharif* of 1952 is 5,400 lb. higher than the highest reached by the prize-winning farmer in the All-India Competition of 1951, and ten times the average per acre yield of the Bombay State for paddy! The Indian farmer forges ahead.

I met this shy, modest-looking farmer last month, through the courtesy of the Bombay Government, amid his village surroundings. He was expecting me, for word had gone round from the District Agricultural Officer the previous evening.

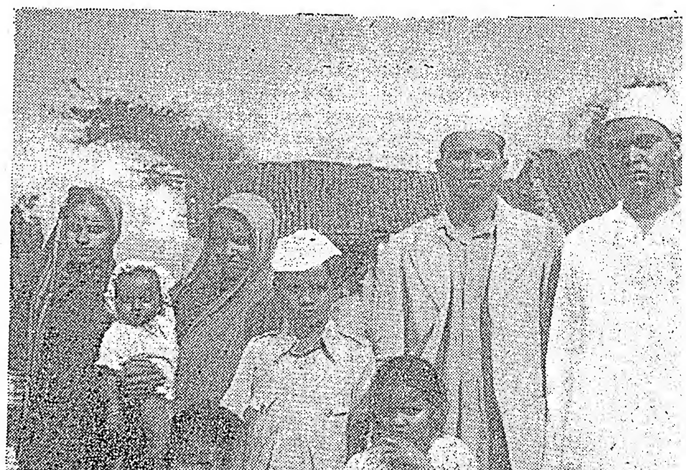
We plunged into conversation after the preliminary introductions had been quickly got over. I learnt that Shri Laxman belongs to a class of professional cultivators, who for generations have earned their living through agriculture. Having lost his elder brother some years ago, Laxman is now the head of a joint family which owns about 95 acres of land. To help him reap golden harvest is his nephew Dagaji Shanker Mali.

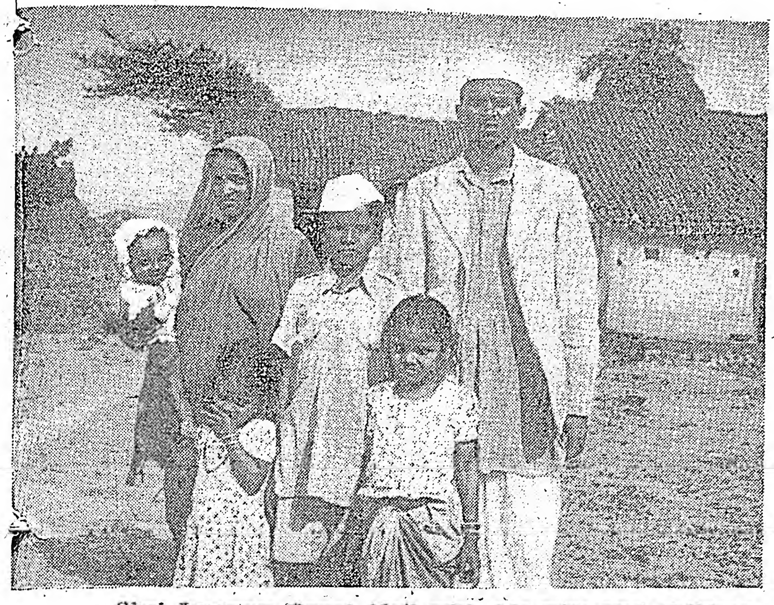
METHODS USED

Asked to elaborate the methods he had used in raising his bumper paddy crop, Laxman explained in his halting Marathi, that the one-acre plot on which the paddy crop was raised is of medium black soil. It was ploughed with a tractor, loaned by the State Agricultural Department, in April, 1952. The land was ploughed again with a country wooden

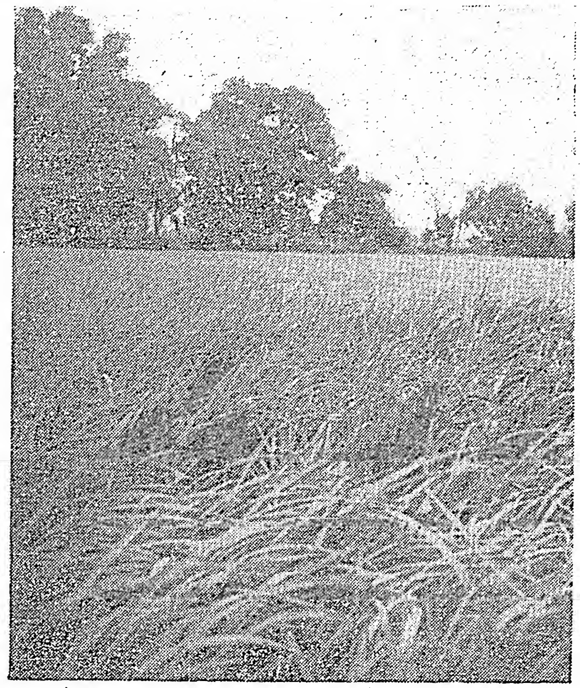
The place where Shri Laxman Gopal Mali lives

All members of the Mali family—except the tiniest—work on the field. The hero with his nephew, their wives and children





Shri Laxman Gopal Mali with his wife and children against the background of his village home

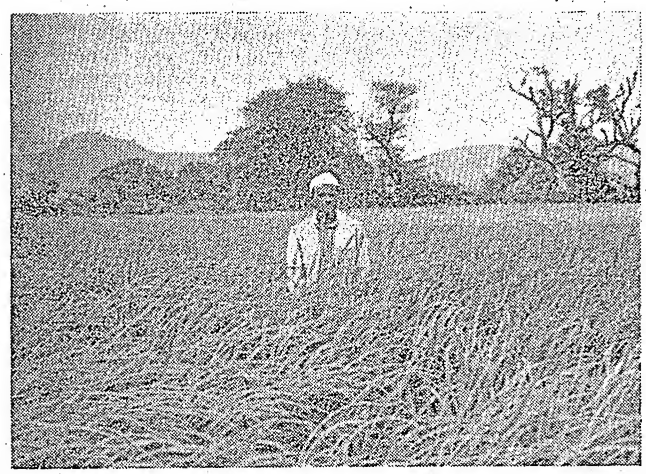


A view of the Prize-winning plot

plough three times. It was then harrowed four times and each time, weeds were removed and destroyed along with other rubbish.

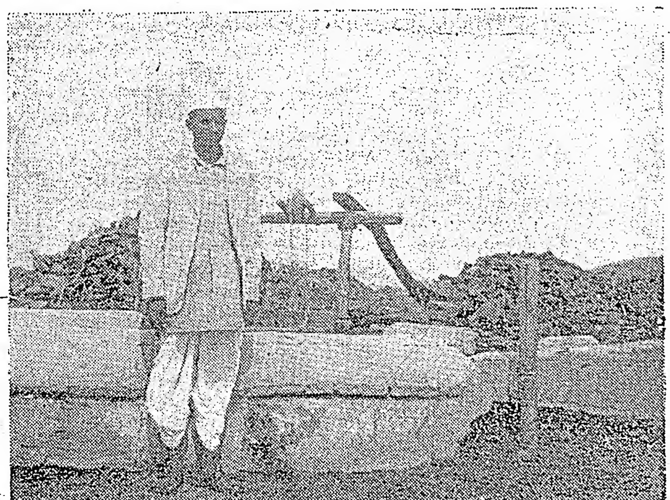
Then followed heavy manuring. Twenty-five cartloads of ripe compost were applied evenly and the land was put under 40 lb. of sann hemp in the month of June. Two months later when this green manure had reached a height of five to six feet, it was buried in the land. The field was divided into eight parts and bunded. It was puddled by bullocks and the seedlings were transplanted at a distance of ten inches. Following the Japanese technique of paddy growing, the seedlings had been raised separately and manured twice with ammonium sulphate. When they were transplanted, they were about 15 inches high.

Irrigation was done initially with canal water and later when this was not available, water was pumped up from a well. Interculturing and weeding were done three times. The first was a month after transplantation, then three weeks later and the final one two weeks later.



Shri Mali in his paddy field

Shri Mali's source of water supply—the well



Another view of the house

The crop received heavy doses of manure. At the time of transplantation, 14 maunds of groundnut cake were applied; a month later ten maunds of '*kharif* manure mixture' were used; two and a half cwt. of ammonium sulphate were applied six weeks later and 10 lb. of borax were used after another six weeks.

I asked the champion farmer the secret of his astounding success. Smilingly he replied: "The use of green manure, heavy doses of organic manure and the use of chemical fertilizers."

I posed him a question: "Can a small-scale farmer with his two or three-acre plot get similar results?"

"Yes", he said, "provided he gets proper irrigation facilities and the requisite financial help."

In his own case, he told me that he had received supplies from the Government on credit, which he had repaid on harvest. He also acknowledged with gratitude the advice he got from the local agricultural department, which had been of great help to him. I was told that Shri Laxman Gopal Mali was a regular visitor to the agricultural depot.

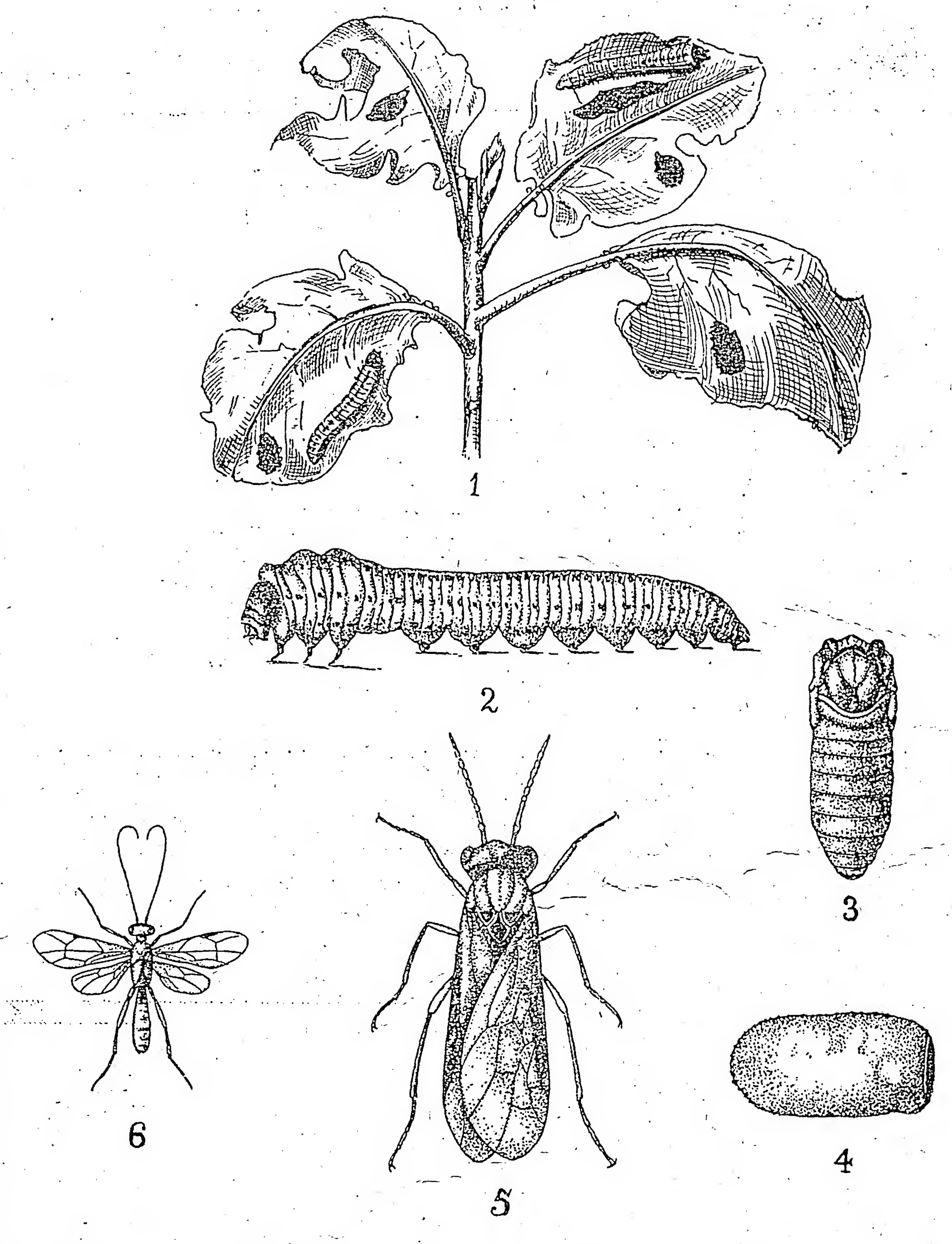
PRIZE WINNER

Shri Laxman's six-foot paddy crop, had about 38 tillers (shoots from the root) in each hill. To prevent "lodging" of the crop, it was supported by coir

(*Contd. on page 31*)

SEASONAL PESTS OF CROPS:

THE MUSTARD SA



THE MUSTARD SAW-FLY ('ATHALIA PROXIMA' KLUG.)

1. Cabbage seedling showing two grubs feeding on leaves 2. Full-grown larva
3. Pupa 4. Cocoon 5. Adult fly 6. Ichneumon parasite

W?FLY, *ATHALIA PROXIMA* KLUG.

a pest in the nurseries of the cabbage family

By

E. S. NARAYANAN,

Head of the Division of Entomology, I.A.R.I., New Delhi

★

THE cabbage family named by botanists as Cruciferae, because of the four petals of their flowers forming a cross, has among its members a number of plants of great economic importance. Cabbage and its diminutive brother Brussels sprouts and their near relations and cousins like cauliflower, radish and turnip are delicious winter vegetables. The mustard plant, another member of the family is one of the most valuable oilseed crops in the Indian Union. Its seeds yield the mustard oil that is an indispensable medium of cooking in millions of homes in Bengal and Bihar, Uttar Pradesh and to a lesser extent Punjab. Mustard is also used in medicine as plasters and poultices to alleviate inflammation and soothe pain. So the importance of preventing or reducing to the minimum, the damage caused by insect pests to these valuable crops needs no emphasis.

The mustard saw-fly is a pest of the nurseries of cruciferous plants like cabbage, radish, mustard, rape, *sarson, toria,* cress, etc. The damage caused by it in certain years is so serious that re-sowing becomes a necessity to reap at least a reasonable harvest. The pest has been recorded from almost all the States of the Indian Union. Only the incidence, the extent of damage and the time and duration of occurrence vary from State to State. In the Punjab, Uttar Pradesh, Bihar and Bengal in the North the pest makes its appearance in the beginning of October and is found in the fields and kitchen gardens upto the beginning or middle of March. In Bombay the saw-fly larvae are found as early as June, but most of the damage is caused in August and September. At Poona the pest is rather bad on cruciferous plants during the monsoon months especially in August. In Madhya Pradesh the pest is found in large numbers in November, December and January. In the Assam valley also it is a bad pest of cruciferous crops during these months. In Mysore and Coimbatore in the South the pest has been observed from November to almost the end of February.

In the nursery or in the field it is a common sight to see the adult flies making slow short flights and now and then resting on leaves. It is also a common sight to see groups of three, four, five or even six larvae nibbling at the leaves of young seedlings in the mornings or at dusk. At the slightest touch these larvae curl themselves and fall on the ground and feign death. The grubs feed on the leaves from the edge inwards towards the midrib. These larvae are not such voracious feeders as those of Lepidoptera. The female saw-fly lays eggs singly inside the tissue of the plant very near the margin of leaves by slitting the margin open, by means of its short, sharp saw-like ovipositor. A female fly lays on an average 35 eggs. The young grub hatches out in about a week and feeds on the tender leaves of the growing plants. The newly hatched out grub is greenish grey in colour and is 2 mm. long and cylindrical in shape, and as it feeds and grows and becomes older its original greenish grey colour becomes darker and darker until it is greenish black when full-fed. The full-fed larva measures 15 to 18 mm. in length. It has the appearance of a lepidopterous caterpillar. It can, however, be easily distinguished from the latter by its eight pairs of prolegs besides the three pairs of true thoracic legs. When full-grown it spins a cocoon of white silk. Sometimes these cocoons with the pupae inside are found in between two leaves, the latter held together by the silken strands of the cocoons. In the majority of cases, however, the cocoon is spun in the soil and has an outer covering of agglutimated soil particles. The larval period lasts from 10 to 15 days and the pupal period lasts for about 10 to 12 days. The larva undergoes metamorphosis inside the cocoon and emerges as adult and thus the life-cycle is repeated. Three broods of the pest have been observed during the cold weather. Where there is no clear-cut winter the pest has more than three generations in a year.

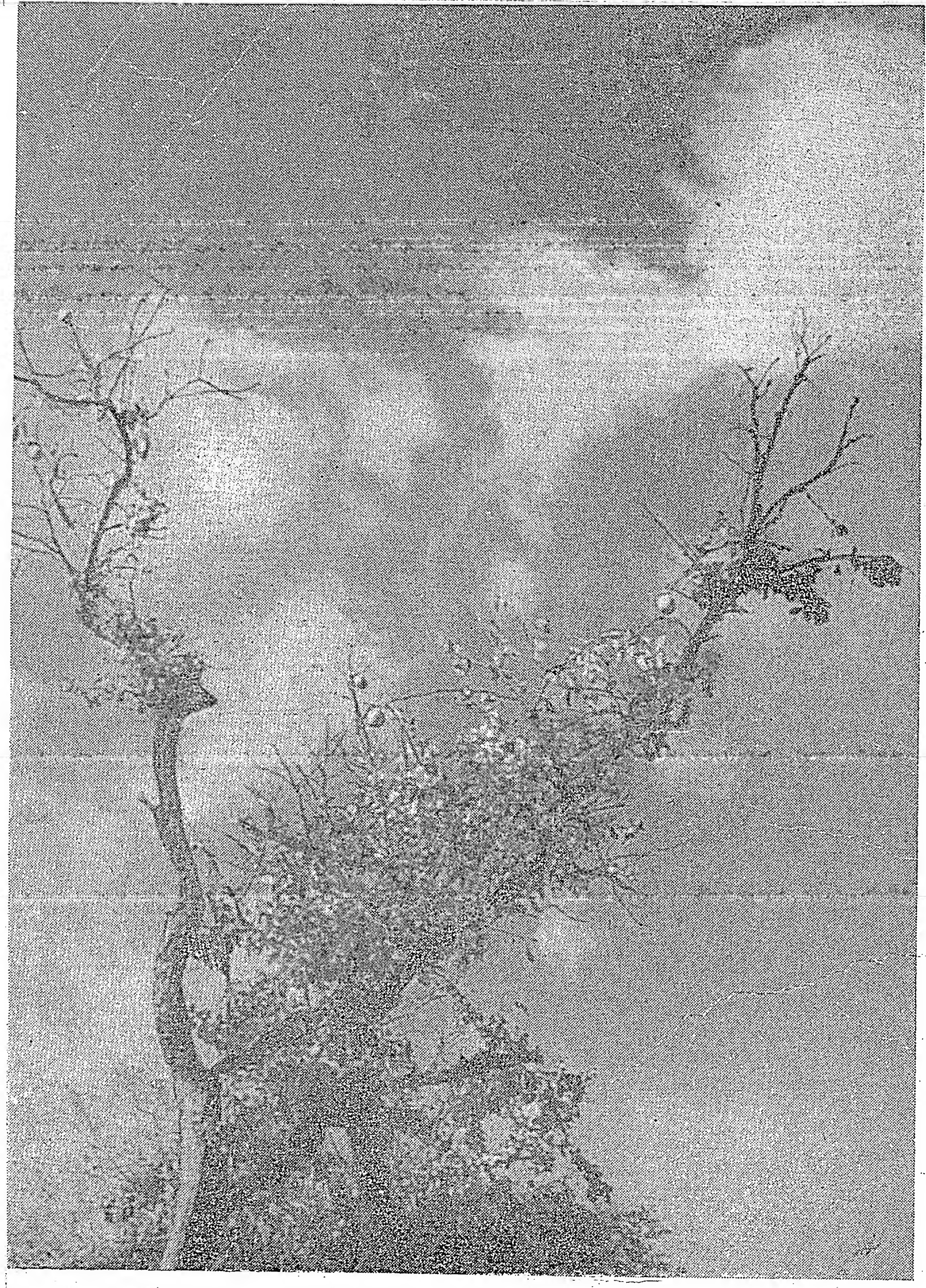
The following control measures are recommended:

(a) Where the area to be treated is small, hand picking of larvae in the morning as well as at dusk offers the most effective method of controlling the pest.

(b) The young seedlings may be sprayed once a week by lead arsenate (1 lb. in 50 gallons of water). This has given good results in the experiments carried out at I.A.R.I. nurseries. The crop has to be washed thoroughly two or three times before being used as food.

(c) Dusting by 3 per cent BHC will give excellent results. In the case of crops where BHC has been used the crop should not be used for cooking for about ten days.

(d) The larvae are attacked by an Ichneumon parasite (*Exacrodus populans*) which also helps to some extent in keeping down the population of the pest.



A 'bel' tree in fruit

Biwa or Bel

(A. MARMELOS)

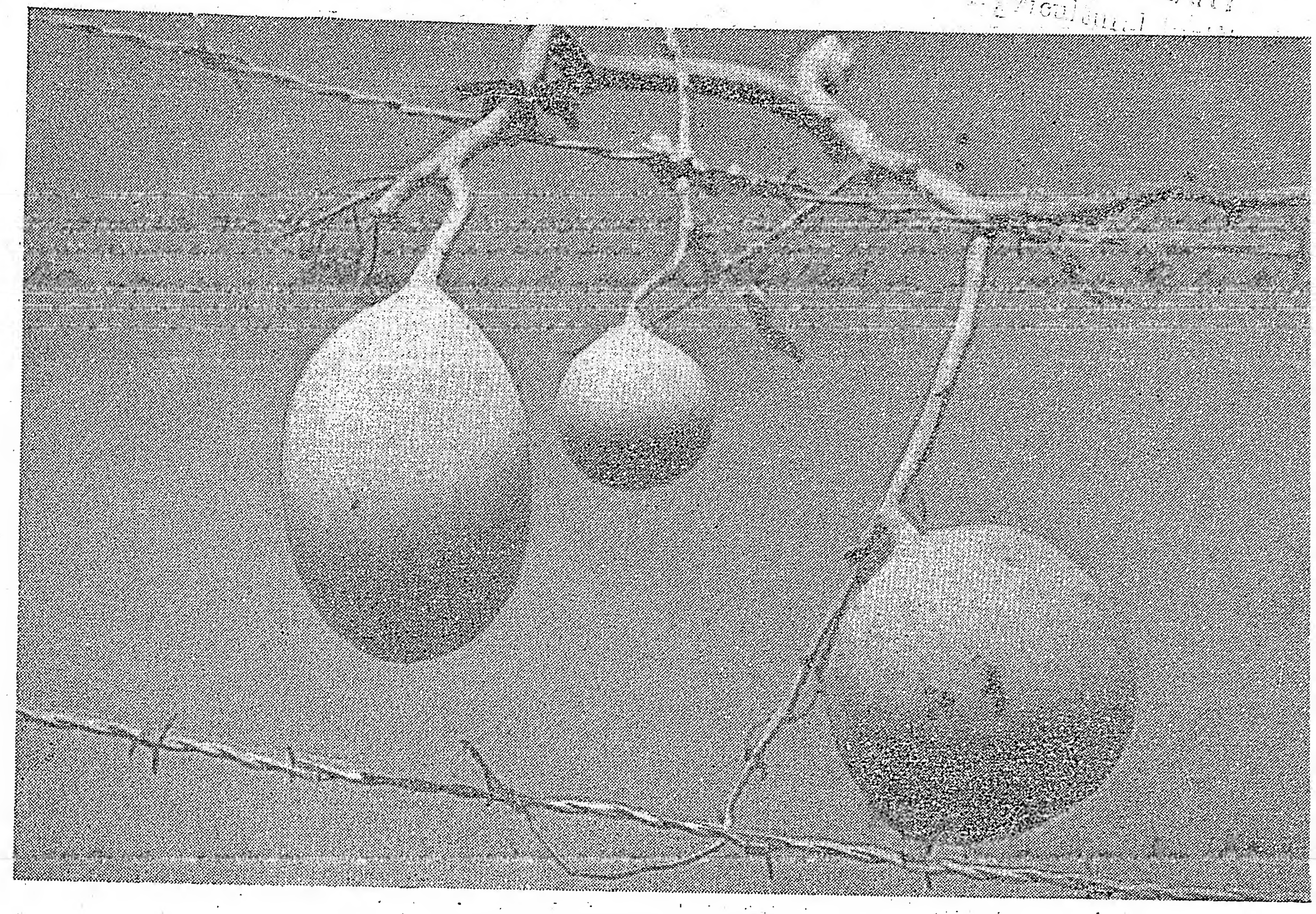
By B. L. CHOUDHRI

THE average Indian diet is deficient in most of the protective elements. Fruits which could have supplied these are rarely added to the menu due to their high cost. A majority of the people is under the wrong notion that fruits like apple, grapes, oranges, etc. only are of real value. The truth is far from it. There are many indigenous fruits that are commonly found growing in India having as much nutritive value as the so-called table fruits. *Bel* is one of them.

This tree is commonly found growing all over the country. In Hoshangabad district of Madhya Pradesh, every village has at least two trees of this. These are mostly protected by someone who exercises a nominal right over them. The fruit can be had free for the mere asking.

CULTIVATION

The tree is not grown as garden plant. But it deserves inclusion in any garden of reasonable size. The plant can be raised from seeds. Select a ripe



The three common types of 'bel'

fruit of a desirable type. Break open the seeds and sow the nursery in June-July. The seedlings will be ready for planting in next June-July. They may then be planted 30 to 35 feet apart according to the variety selected.

The tree will need attention in the first year, when it should be manured after the rains. Weeds should be removed during the rains and protection should be provided against stray cattle, goats and the worshippers of Lord Shiva. It should be irrigated when necessary.

The tree will start fruiting in about five years and will be at its best in the tenth year.

VARIETIES

There are no standard varieties of *bel*. The size of the fruit also varies. They may be round or oval in shape. Some rare varieties have very strong odour creating nausea, whereas there are others that are mild and sweet-scented and delicious in taste. In the varieties of latter type the number of seeds is also small. Such a variety should be selected for propagation.

Raising of plants by *gootee* and marching may be tried from a desirable tree bearing fruits of excellent quality.

YIELD

A tree may bear 300 to 400 fruits of smaller size. The large fruit type will yield about 200 fruits. On an average five to six maunds of fruit may be expected from one tree.

NUTRITIVE AND MEDICINAL VALUES

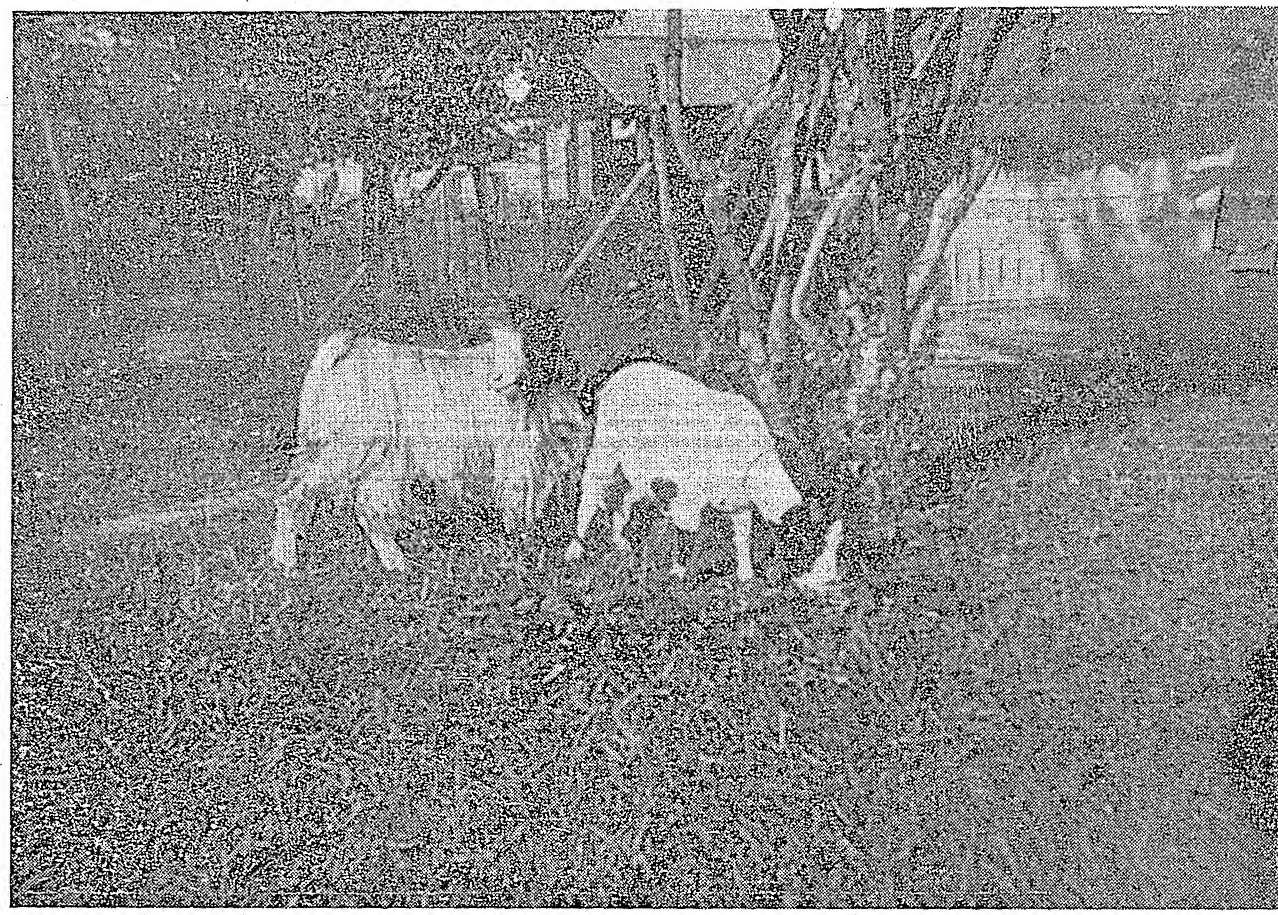
The fruit compares favourably with apple and pomegranate in its nutritive value:

Fruit	Protein	Carbohydrates per ounce	Fat	Calories
Bel	0.18	9.5	0.2	20.8
Apple	0.11	2.19	—	9.2
Pomegranate	0.18	0.19	—	9.0

The fruits are available throughout the hot season. This is the time when *sherbet* is in great demand, which has a cooling and refreshing effect.

The pulp from roasted unripe fruit is also efficacious in correcting minor digestive disorders. It is of immense value in cases of obstinate diarrhoea and dysentery when unattended by fever and when the patient is weak and dyspeptic. Unripe or half-ripe *bel* is astringent, digestive, aromatic and cooling.

In irregularity of bowels *bel* is particularly useful for it acts as a mild stimulant to the intestinal mucous membrane and, while it tends to arrest diarrhoea, it no less certainly acts as a laxative in cases of constipation.



A pair of Naga goats — (left) male, (right) female

GOAT BREEDING IN ASSAM

By D. L. PAUL

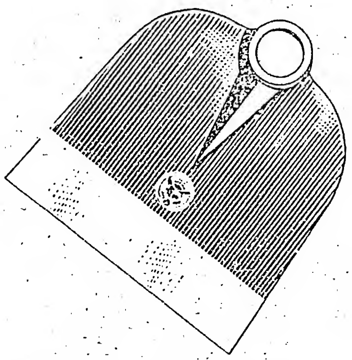
ACCORDING to the livestock census of 1951, Assam State owns nearly nine lakhs of goats contributing about $1\frac{1}{2}$ crores of rupees to the national wealth. The main business relates to milk, meat, skin, etc. of the goats.

The local goats constitute a mixed breed of non-descript origin. The variation in the individuals can be observed in the existence of beards, length of hair and body colour. Attempts have been made since 1929 to improve the local types by various methods; cross breeding with the Jamnapari breed appears to have given successful results.

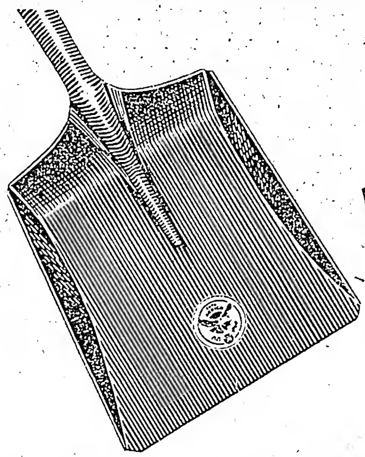
INTRODUCTION OF JAMNAPARI GOATS

Considering its high degree of prepotency, the Jamnapari breed was selected to grade up the local goats into a dual purpose type for milk and meat. The first lot of Jamnapari goats for breeding purposes was brought from Hissar Government Farm in 1931. This herd consisting of good specimens, possessing desirable characters like long legs, Roman nose, close coat and long pendulous ears, was first kept at the Upper Shillong Farm, wherefrom the goats were distributed to Khanapara and Sylhet Farms for purposes of breeding to upgrade the local varieties. The death roll was rather heavy in this imported stock due to the effects of changed environment and absence of adequate veterinary protection.

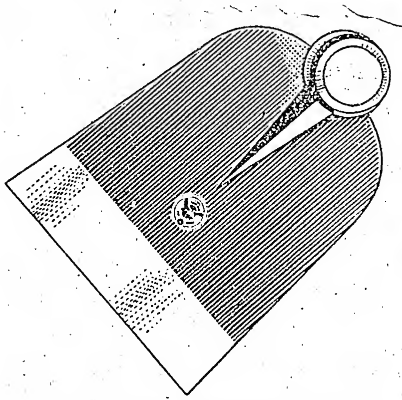
Since then some more Jamnapari goats were brought into Assam. These later imported stocks were to some extent acclimatized to the environmental changes and brought out improvements to some extent in the local goats. Some of the Jamnapari bucks supplied to villages have actually become progenitors of kids who were lop-eared, tall-legged and of Roman nose conformation. It has been noticed that in many parts of Assam a female goat of the improved stock is capable of yielding about one to two pounds of milk daily even after feeding its kids.



BOMBAY POWRAH: Amazingly strong and easy to handle. Available in $2\frac{1}{2}$ lbs., $2\frac{3}{4}$ lbs. & 3 lbs.



SQUARE-NOSED SHOVEL: Made from high-carbon Steel to I.S.I. specifications. Fitted with seasoned wooden handles.



WEST INDIA POWRAH: Extremely sturdy, and well-balanced. Specially fortified shoulders ensure long life.

FOR PRODUCTIVE FARMING

you can depend on

In thousands of India's farms, Agrico implements are doing a wonderful job today. Made from high-carbon steel and specially tested for superior strength, Agrico implements are the choice of farmers everywhere!

TATA AGRICO IMPLEMENTS

THE TATA IRON & STEEL COMPANY LIMITED

Head Sales Office :

23-B, Netaji Subhas Road, Calcutta-1

Branches at : BOMBAY, MADRAS, NAGPUR, AHMEDABAD, SECUNDERABAD, KANPUR, JULLUNDER CANTT. & VIZIANAGRAM CANTT.

AG. 3865

ealth From Tobacco Wastes

By M. S. PATEL and A. N. SRIVASTAVA,
Indian Central Tobacco Committee

THE role of tobacco in the country's economy is of multifold importance. Agriculturally, it brings to the Indian grower an annual return of about Rs. 45 crores, although its total acreage is only .34 per cent of the total crop area in India. Commercially, it fetches for the country foreign money to the tune of Rs. 15 to 18 crores. By way of excise duty, it enriches the nation annually by about Rs. 34 crores. Besides, it provides means of livelihood to a very large number of persons in the various branches of its industry.

The economic potentialities of its by-products have, however, not yet been fully appreciated. The first by-product which is met with in the industry of tobacco production is the seed. In our country, it is only the cigarette-tobacco which is allowed to seed besides ratoon crop of *bidi*-tobacco. The inflorescence of all other types of tobacco are topped to give high yield and heavy-bodied leaf. It is estimated that about 4,000 tons of seed are annually produced in India. Till 1951, this was more or less allowed to go as waste. Experiments have shown that cattle, if fed with tobacco seed by grinding it into a paste, thrive equally well as when fed with similar costlier feed. It does not contain nicotine or any harmful substance.

TOBACCO-SEED OIL

Like seed, oil is also free from nicotine and other harmful substances and has been proved to be quite suitable for culinary purposes. During War, when supplies of groundnut oil went short, tobacco-seed oil was being consumed in European countries like Bulgaria and Germany.

Experiments have further shown that it can be used as a semi-drying oil in the manufacture of enamels, paints and varnishes. The tobacco-seed oil has a significant advantage over linseed oil in as much as it does not turn yellowish on keeping. It has been further reported that tobacco-seed oil, when properly treated, yielded better results than linseed oil in the preparation of varnishes and ready mixed paints. Its film had good gloss, adhesion, flexibility and water and electric resisting properties.

The oil burns quite steadily giving mild and smokeless light. The consumption of oil is also lower as compared with other oils. The following is the analysis of combustion tests on different types of oil:

Kind of oil	*Duration of light for 3 oz. oil*
Tobacco-seed oil	21 hours
Groundnut oil	21 "
Pungam oil	20 "
Ippah oil	20 "
Margosa oil	20 "
Mustard oil mixed with 25 per cent groundnut oil	25 "

The oil has also been tried with success against small insects and white ants. Casurina posts when treated with this oil were not attacked by white ants.

It is estimated that the present extraction of oil from available seeds is about 150 tons annually.

OILCAKE

Tobacco oilcake which is cheaper in price than other oilcakes has been successfully applied as manure in areas of production to crops like sugarcane and paddy.

Feeding trials with this cake conducted at the Agricultural Research Station, Guntur, had proved that it had no adverse effect on the animals. The cake is also fed to horses in other parts of the world.

TOBACCO DUST

The next by-products of the tobacco industry are dust and waste. Experiments undertaken by the Indian Central Tobacco Committee have indicated that dust, when applied to tobacco crop over a basal dose of groundnut cake, increases the yield and, in a way, matures the crop earlier than when treated with groundnut cake alone. Application of stem-dust has an additional advantage of incorporating into the soil large amounts of organic matter which improves the texture and water-holding capacity of the soil—a very important factor in our farming.

TOBACCO WASTE

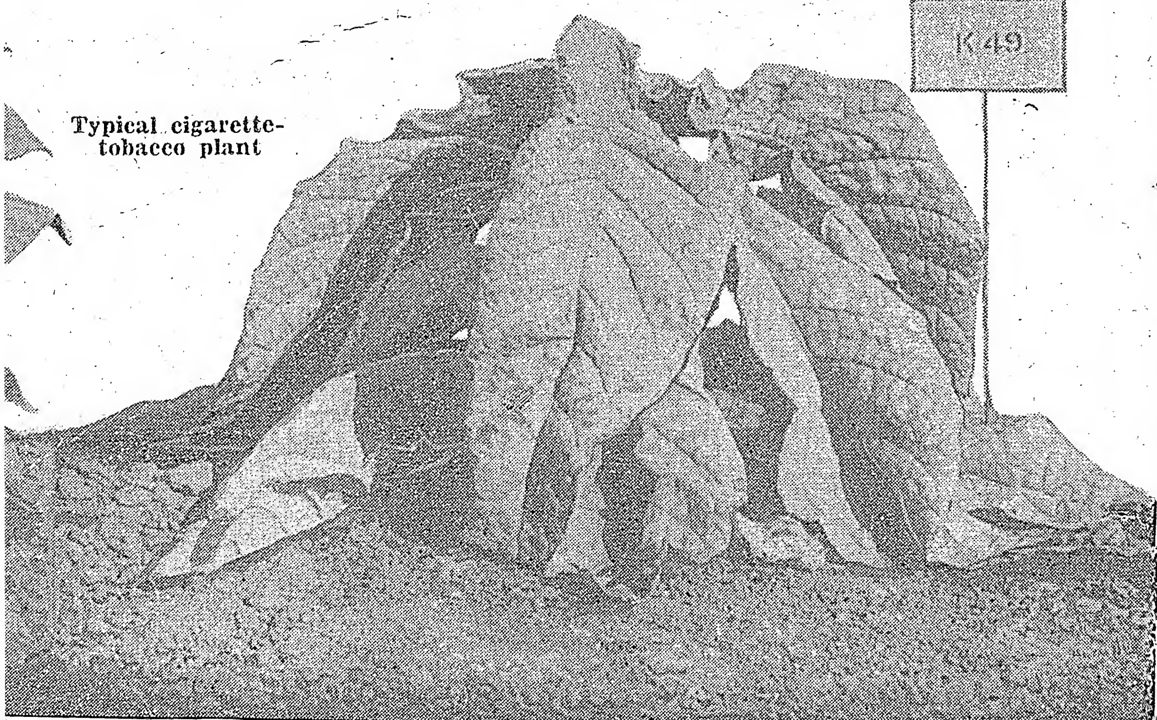
By far the most important by-product is the tobacco waste. It contains about 0.6 to 4 per cent of

(*Contd. on page 32*)


Tobacco field showing inflorescence prior to last priming

Well-grown tobacco nursery

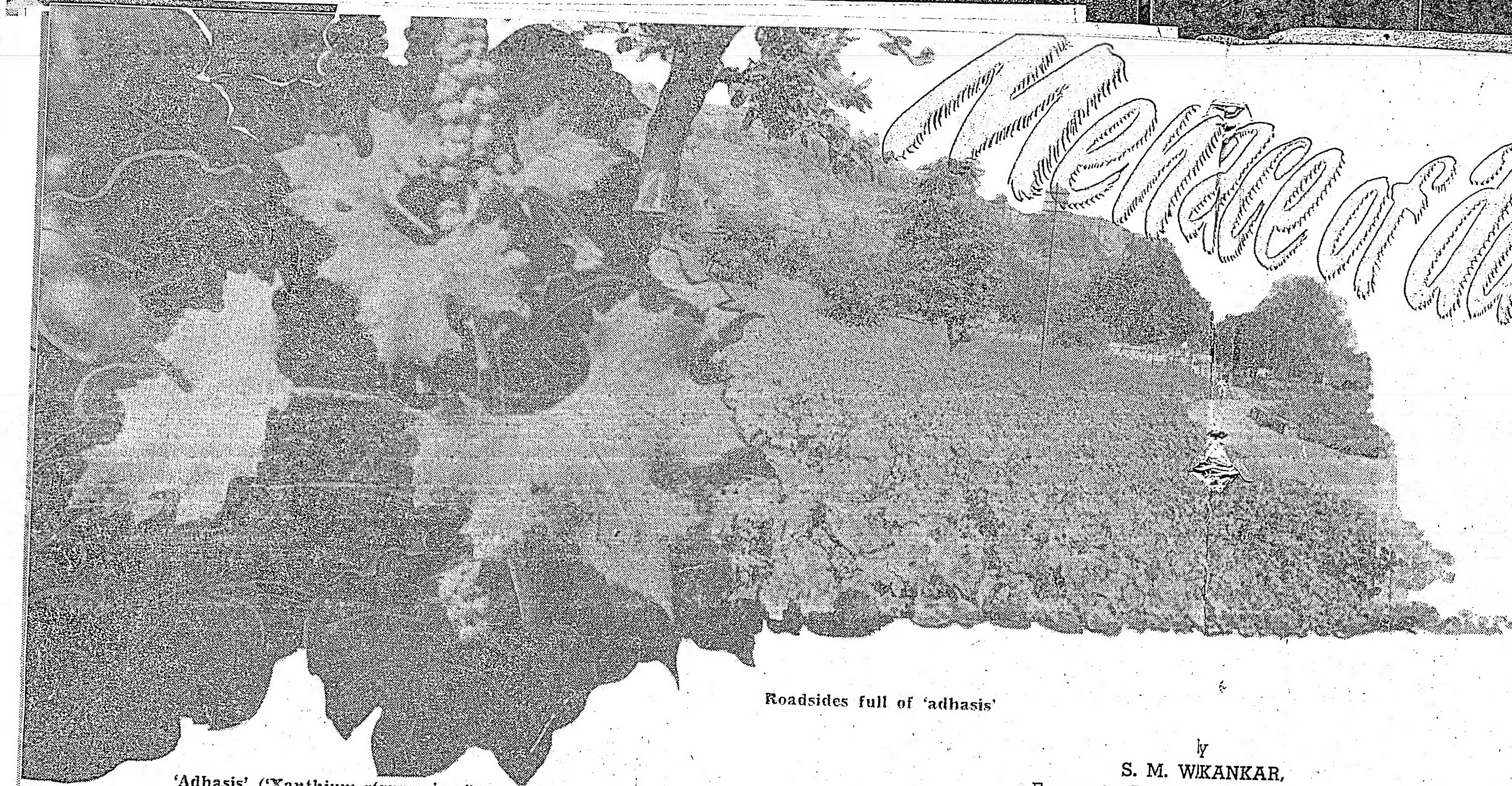
Mature 'bidi'-tobacco plant



Typical cigarette-tobacco plant

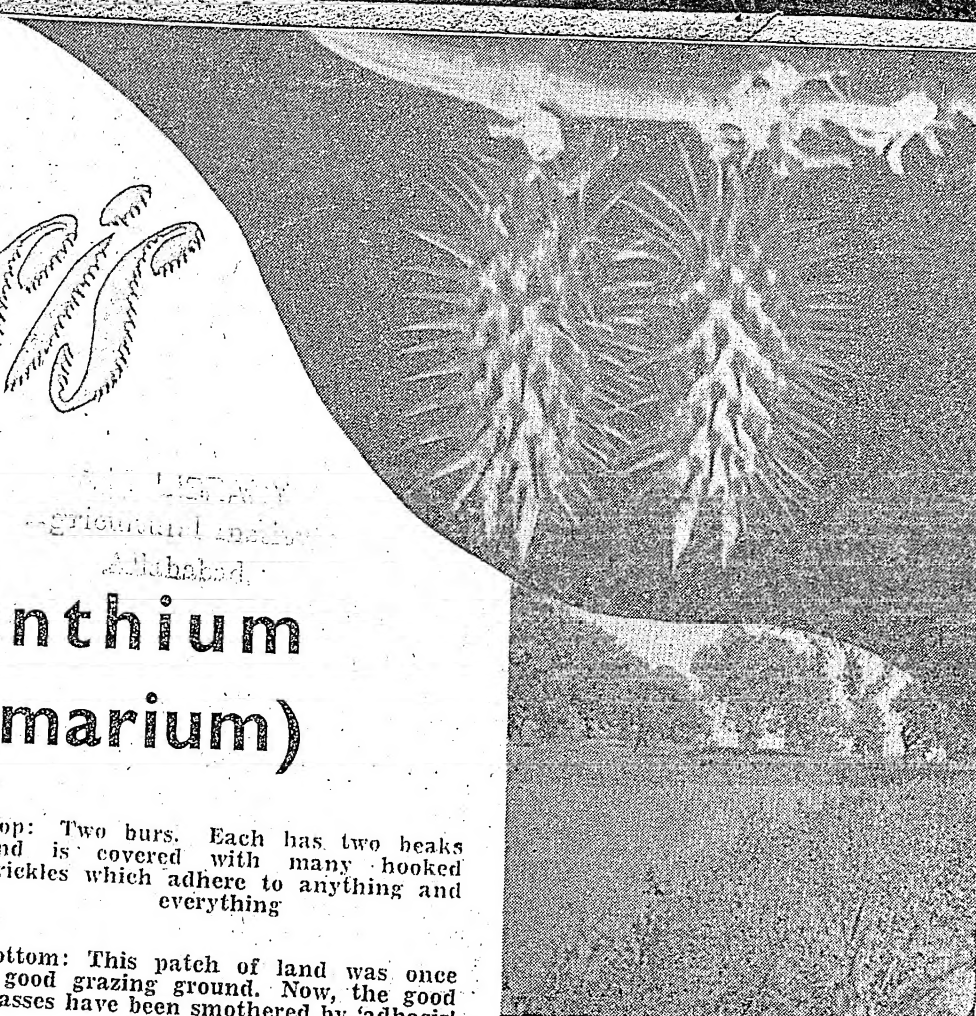
Menace of Adhasis

(Xanthium Strumarium)



Roadsides full of 'adhasis'

'Adhasis' ('Xanthium strumarium')



Top: Two burs. Each has two beaks and is covered with many hooked prickles which adhere to anything and everything

Bottom: This patch of land was once a good grazing ground. Now, the good grasses have been smothered by 'adhasis'

by
S. M. WIKANKAR,
Economic Botanist, Madhya Bharat
Government, Gwalior

THIS pernicious weed is commonly known as cocklebur or sheepbur in English and as *chota dhatura* or *chota gokhru* and *shankhahuli* in Hindi. In the central parts of our country it is known as *adhasis*. It is called *arishta* (calamity) and *shankhini* in Sanskrit, *bun-okra* in Bengali, *shankheshwar* in Marathi, *kullan* in Punjabi, *marlu-multa* in Tamil and *veritelnep* in Telegu.

Adhasis is a coarse annual weed reproducing by seeds. Its stems are erect and stout with spreading branches. They are coarse, rough, spotted and bristly. The leaves are alternate, triangular, heart-shaped and somewhat lobed. They are rough and hairy on both the sides and both the stems and leaves are quite unpleasant to touch. Flowering heads are in recemes, males above and females clustered at the base. The fruit is called the bur. It is about two centimeters long, is two-beaked and is covered with hooked prickles which adhere to the passing animals and cause the seed to be distributed. The bur is dark brown in colour.

The usual period of growth of *adhasis* plant is from July to October. The seeds germinate immediately after the first shower of rains in late June or early July. The growth is very vigorous, the plants growing to a height of about five feet. Flowering commences from the last week of August or early September and the burs are formed in the last week of September or in early October. The burs are mature by the end of October and are freely distributed from November when the plants dry. From a few to 1,200 burs are commonly produced by each *adhasis* plant according to the growth conditions available.

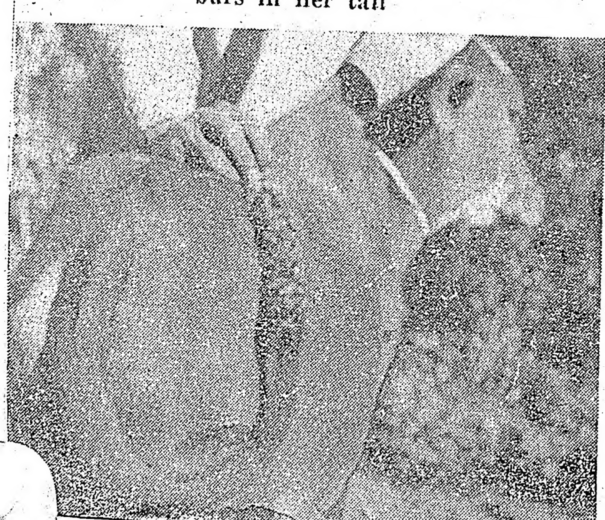
The leaves of *adhasis* yield a yellow dye, seeds a useful oil and the fruit is used in medicinal preparations. The dry stems are collected by the poorer labourers in the cold months of December and January and are used as fuel.

MEDICINAL PROPERTIES

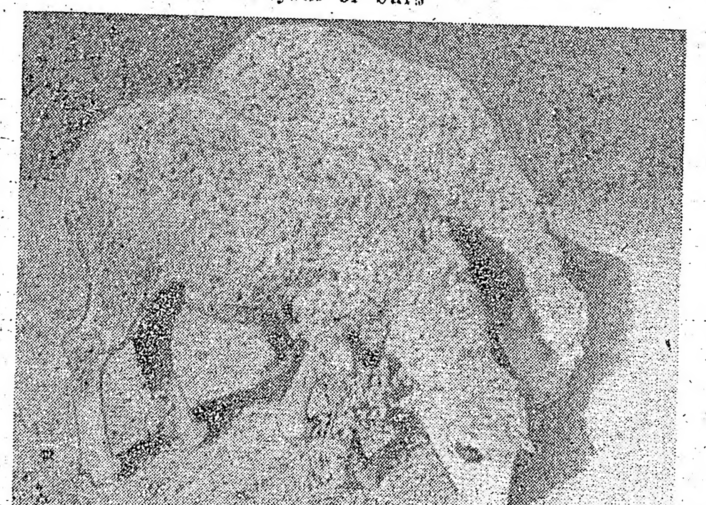
The whole plant of *adhasis* is supposed to possess powerful diaphoretic and sedative properties. It is said to be very efficacious in long standing cases of malarious fevers and is also given in urinary and renal complaints, in gleet, leucorrhoea and menorrhagia. The root is useful in cancer and struma. The prickly fruit is considered cooling and demulcent and is given in small pox.

(*contd. on page 31*)

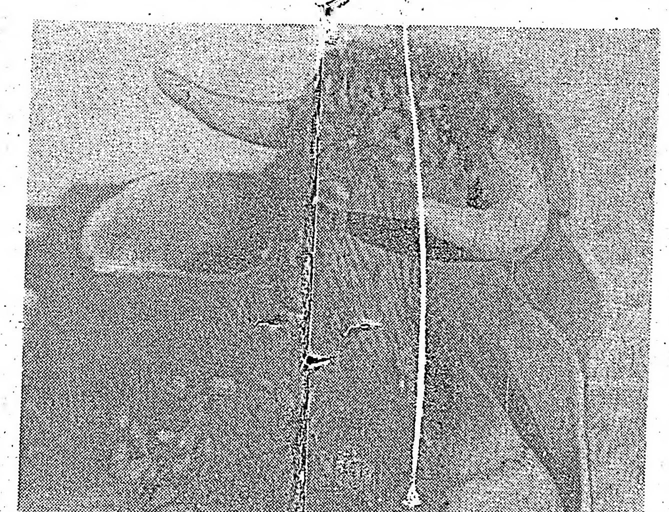
This poor calf is not happy with a bunch of burs in her tail



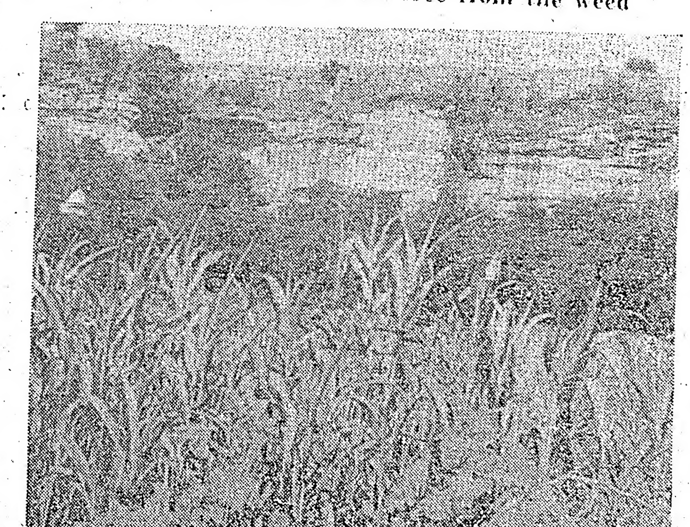
They went for a mouthful of grass and got a bodyful of burs



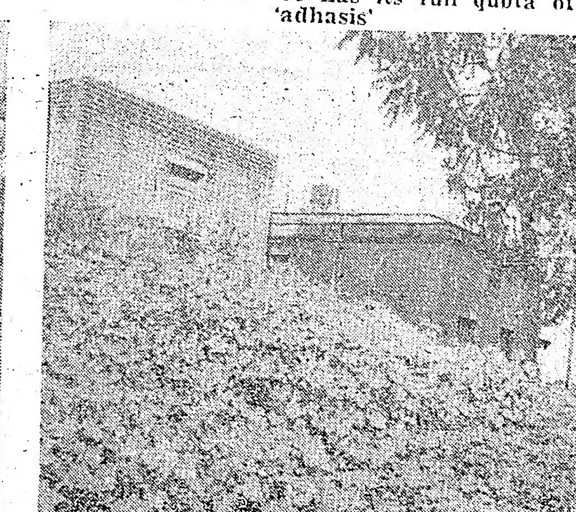
He too got a hadful of burs

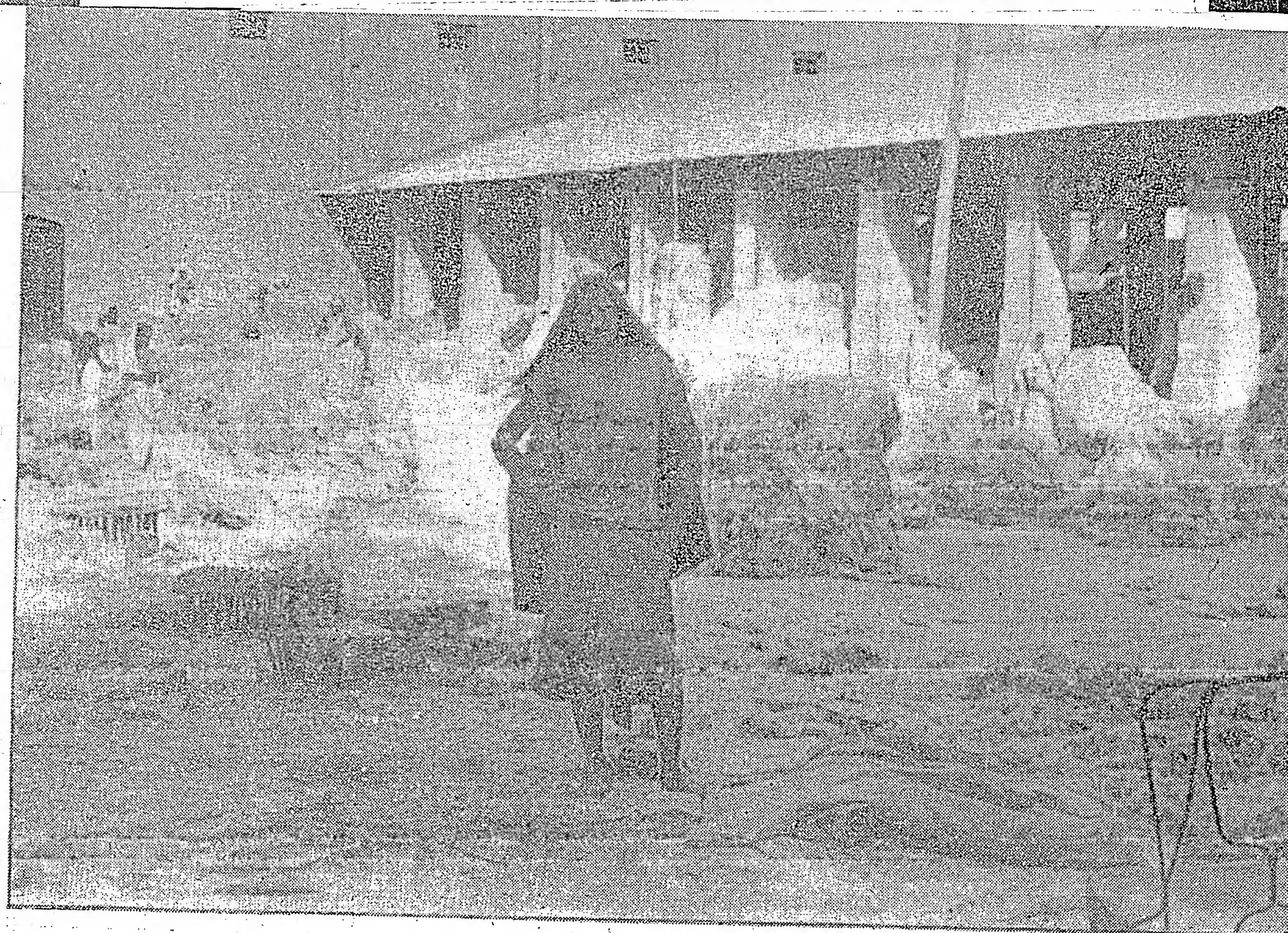


This field border also is not free from the weed



This back-yard too has its full quota of 'adhasis'





Cleaning and grading of Banaras sann-hemp at an authorised packer's premises

AGMARK SANN HEMP GRADING IN INDIA

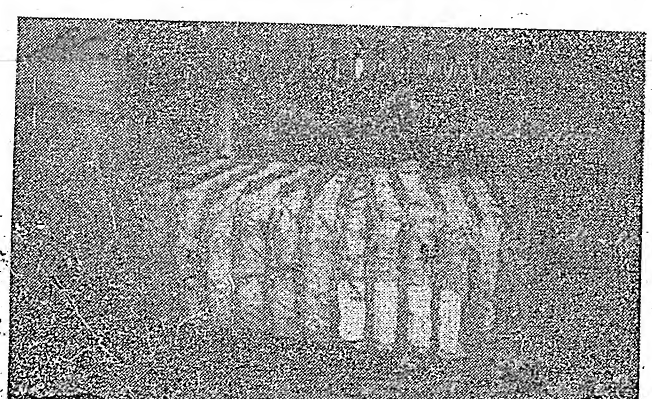
By PARTAP SINGH

THE quality of sann hemp exported from India during the last many years prior to the inauguration of the Agmark Sann Hemp Grading Scheme in 1942 was not upto the desired standard, and there were numerous and persistent complaints from buyers abroad. Not only standards of packing were poor but they also varied considerably from time to time. The deterioration became particularly marked after the outbreak of the Second World War.

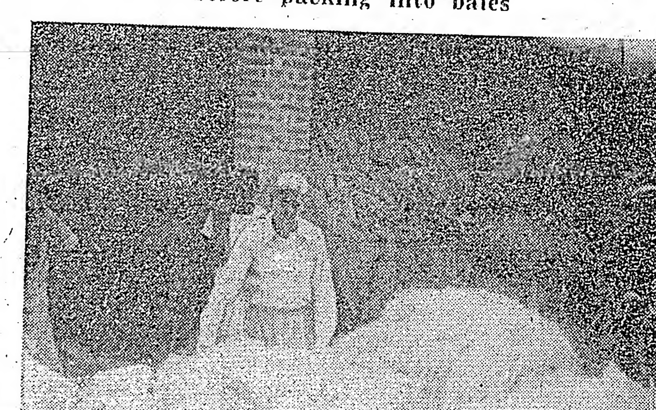
In 1942, the Government of India issued the Sann Hemp Grading and Marking Rules, and the export of sann hemp not graded in accordance with these Rules was prohibited from December 1, 1942.

For determining the grade of a lot, colour, condition and nature of its fibre, its refraction content and in the case of 'line' fibre, minimum length

A bale of sann-hemp bearing an Agmark label from a hydraulic press



Checking the quality of graded Banaras sann-hemp before packing into bales



of hanks are taken into consideration. In case of doubt regarding colour of fibre it is compared with standard samples prepared each season in consultation with the trade according to fixed standards representing minimum quality of each grade. Texture and dryness of fibre are judged by handling it and its strength by pulling. Refraction is ascertained by cleaning representative samples and length of hanks with a measuring tape. Each agmarked bale carries a serially numbered cloth-backed Agmark label indicating its trade description and grade, year of harvest and date of packing.

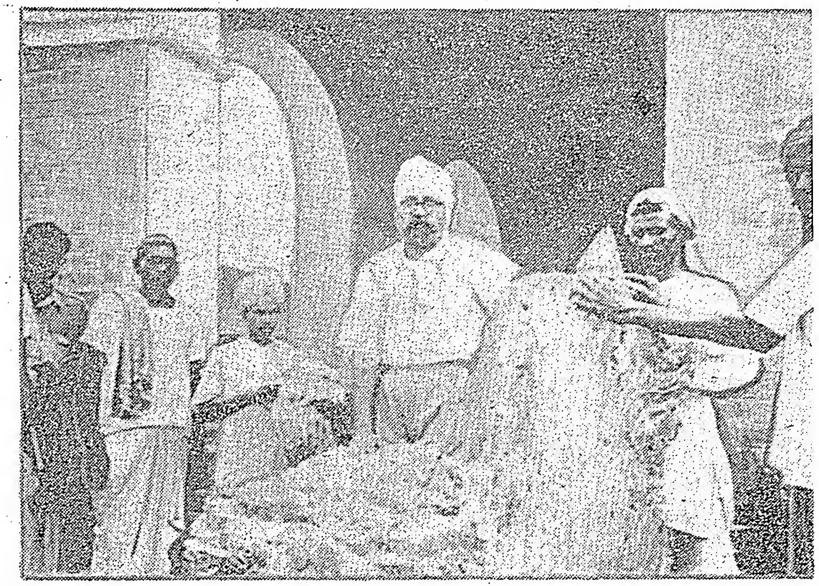
The London Hemp Association has expressed satisfaction with the working of Agmark system relating to sann hemp. A similar favourable impression has been made in the American market and transactions are now being entered into on the basis of Agmark grades and labels. All this shows that with the help of the Agmark the Indian sann hemp has turned the corner and is already on its way to occupy a respectable position amongst the hemps of the world. The reputation built up by the Agmark sann hemp in the foreign markets attracted the attention of the local consumers also. The paper mills in India turned to Agmark sann hemp and they too found it convenient, dependable and economical in comparison with un-Agmarked sann hemp.

EXTENT OF IMPROVEMENT

With the introduction of the Agmark Sann Hemp Grading Scheme a check over quality came about. The main lines of improvement effected are indicated below:

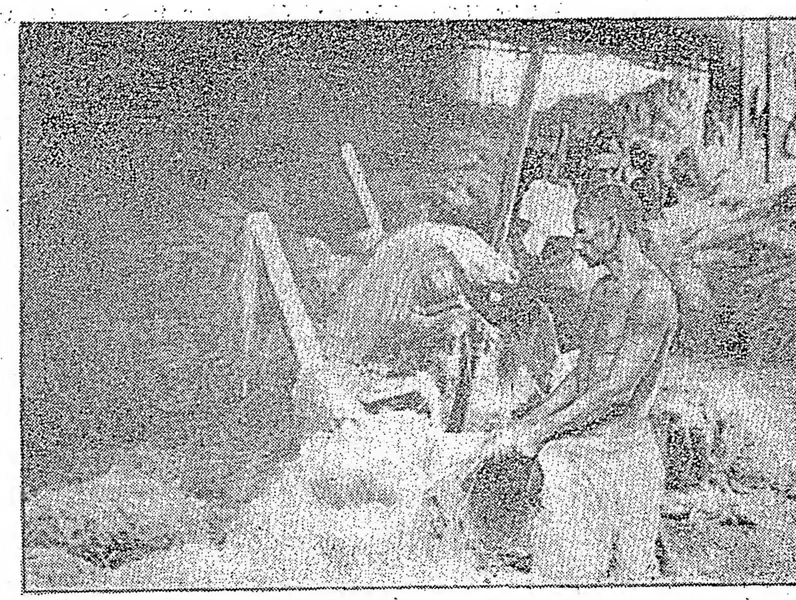
Abolition of 'gundi'-packing: A *gundi* is a small bundle of fibre twisted, folded and tied, and *gundi*-packing connotes packing in *pucca* bales of these *gundis* without opening and cleaning them. *Gundis* are originally made by producers and their fibre in some tracts is twisted fairly tight so that it takes a good deal of time and labour to tie and untie it. Besides wastage of time and labour, *gundi*-packing involved packing of mud along with fibre particularly in the case of green sann hemp produced in tracts where there is scarcity of water. The quantity of such muddy sann hemp exported from India was not large but on account of the fact that wherever these *gundis* were opened the atmosphere became dusty and obnoxious, some countries were reported to have actually legislated against the consumption of Indian sann hemp. The Agmark Scheme has stopped *gundi*-packing since December, 1943.

Elimination of 'tied heads': Tiny bundles of sann hemp tied with a few strands of fibre near the butt-ends are called 'tied heads'. 'Tied heads' are found in the case of Dewghuddy and Ganjam or green, undressed sann hemp received from certain tracts. These are prepared by the producers while the extraction of fibre from the retted plants is in progress. Before the introduction of the Agmark Scheme, the 'tied heads' found their way to the foreign markets. Apart from harbouring extraneous matter such as 'stick', leaf and dirt, 'tied heads' caused a good deal of annoyance and some



Checking up the grade of an agmarked bale

Dressing of green sann-hemp



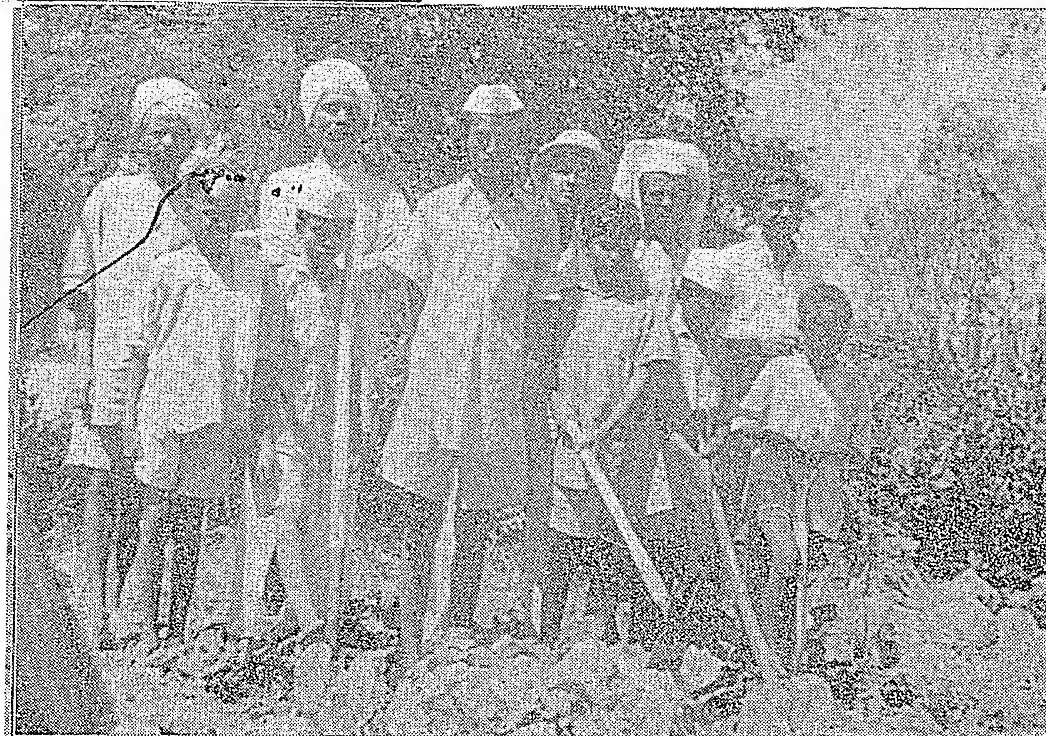
expenditure to the consumers as they had to be untied before use.

After the introduction of the Agmark Scheme 'tied heads' had automatically to be opened to a very large extent with a view to bringing down the refraction content to the prescribed limits.

Reduction in refraction: Abolition of *gundi*-packing naturally resulted in the reduction of refraction in that part of green sann hemp exports which was formerly shipped in the form of *gundis*. In the case of other qualities also there was a general reduction in refraction after the initiation of the Agmark Scheme.

Improvement in assortment of fibre: Along with the appreciable reduction in refraction content there has been a marked improvement in the assort-

(*Contd. on page 23*)



The little village of Kodipura has a small group of Young Farmers' Club members

EXTENSION PILOT PROJECT MALAVALLI

By HANS E. KARDEL

"THE way to a man's heart is through his stomach" is a common expression in the U.S.A., but just as surely the way to develop farm family co-operation with the Extension Service in India as well as in the U.S.A., is through the village young people. Too often we are guilty of neglecting our most important crop, our boys and girls, instead of providing them with every opportunity to grow up and become happy, useful citizens. There is very little difference between young people in Mysore State and the same age group with which it was my privilege to work in Eaton County, Michigan for nearly 23 years. Developing a constructive programme for youths as well as for their elders should be an important goal for every Extension worker.

A CHALLENGE

When the Extension Pilot Project was inaugurated in Malavalli Taluk, Mysore State, on 9 August, 1952, our 15 Village Extension Workers and four Extension Officers were challenged to organize at least one Young Farmers' Club in each one of the 100 villages comprising the Project area.

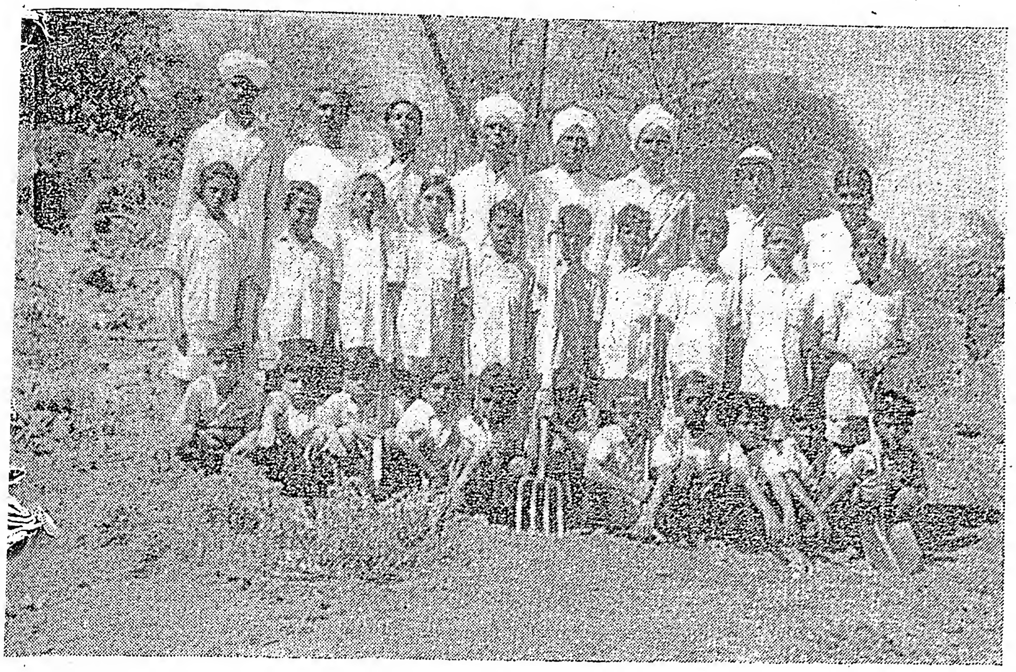
It did not take the Extension workers long to appreciate the opportunities in promoting youth activities in their villages. To Shri Anke Gowda belongs the honour of organizing the first group of six young farmers aged 15 to 22 in the village of Maganur. A small vacant plot was secured for the vegetable garden and with the aid of Shri Anke Gowda the hard, barren ground was soon changed into a promising garden spot. It should be mentioned also that the fathers of the young farmers were out there helping too, just as proud as the boys of this venture, in introducing vegetable crops to their village.

FIRST HARVEST

It seemed only a short time after that when three Maganur boys brought a basket of carrots to the Travellers' Bungalow which serves as a our headquarters while in the Project area. "You helped us plant our carrots", they said, and added, "we want you to taste our first harvest". Best of all the idea caught on and three more plots were located to take care of the new members. Today Maganur has an enrolment of 25 young farmers growing vegetables. Up to 31 January 1953, practically all of the members were boys, but on that date Shri Gowda invited us to speak on 4-H girl activities in the U.S.A. to a class of middle school girls in Malavalli. Through the good cooperation of the Head Mistress, Extension Officer Dwarkanath and Extension man Gowda are now helping to plan a programme for the 18 girls enrolled. One of the best young farmers' gardens is located in Jadaganapura. Here Extensioner T. S. Mallasettappa is justly proud of his Club with 25 members, and also of the fact that everyone of the 24 houses in this small village is the home of a member of the Young Farmers' Club. Most of the members of this area are in the older youth group, 17 to 22 years, and few of these never had an opportunity to attend school. Whenever you visit this village there is always someone out there in the community garden, weeding or watering the plants or just admiring the healthy growth of these 'new vegetables'—beets, carrots and knol-khol.

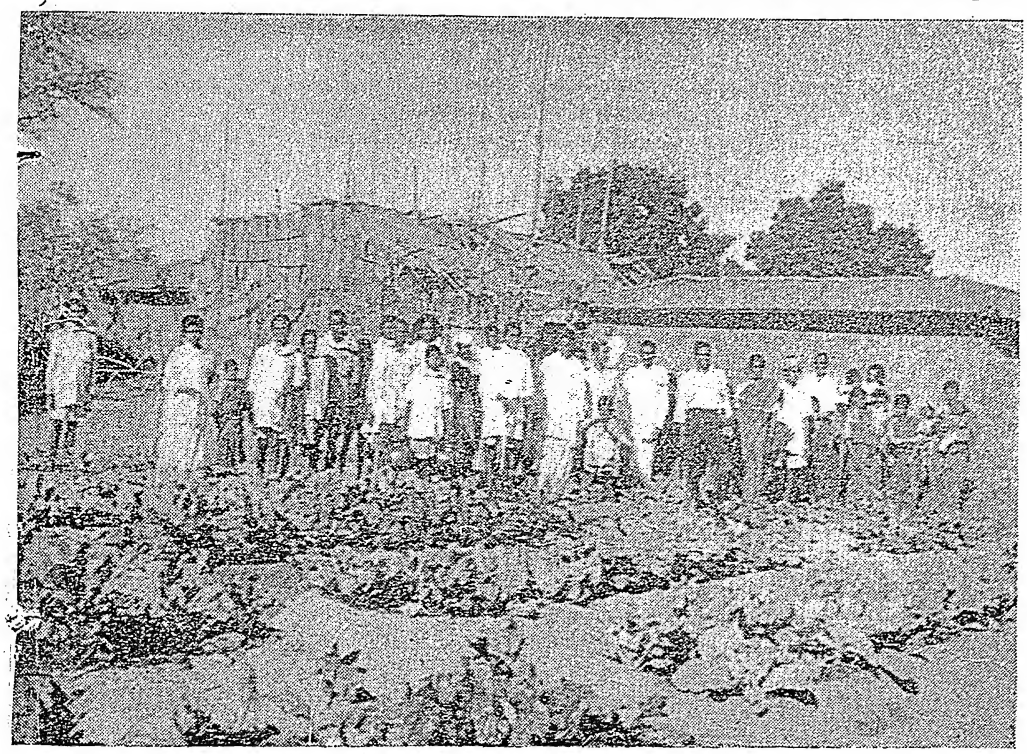
GROW MORE VEGETABLES

Other well-cared-for young farmer club gardens are located at Ragibommana Halli under the direction of Shri Karisetty, the Extension Worker and in Kirgaval with Shri Hanumappa in charge. In Hanavadi and Belakavadi with a combined total of about 60 boys the clubs were organized in co-operation with the local Head Master of School, Shri M. Mariswamy, who is also Warden, D. C. Hostel, Hanavadi and Shri Sreenivasa Iyengar, Head Master, Primary Boys School, Belakavadi, who are contributing freely time



Ground for a garden just allotted to Belakavadi Young Farmers' Club

Parents too are interested in the Young Farmers' Club at Jadaganapura



and effort in assisting Shri Srinivasa, Shri Chakravarthy and Shri Krishnamurthy Rao—the Extension Workers, in the 'grow more vegetables' programme. The six members of a girls' club in Belakavadi, the first to organize in the Project area, enjoy their sewing project and have also been taught several drills and exercises by Shri Krishnamurthy Rao. Inspired by the 'across the line' transformation of an uncultivated plot into a fine young farmers' garden, Belakavadi Sub-Inspector of Police, Shri Seetharamiah, started a vegetable garden in the police compound which is the pride not only of the police force, but of the whole community.

All the clubs are organized with a President, Vice-President, Secretary and Treasurer elected from the membership and one or more local folks acting as leaders. Recently the Project Officer, Shri Rudramurthy and T. C. A. Training Specialist, Dick V. Fagan have suggested to Extension Director, Dr. B. T. Narayanan, a one-week training course for the Young Farmers' Club leaders. So far practically all of the efforts have been centred on 'grow more vegetables' for which there is a great need in every locality. However, Extension men hope to be able to branch out into poultry and follow with other livestock projects.

The hand tools provided by CARE have been a great encouragement and in every Young Farmers' Club members are very appreciative and are making good use of them. Another encouraging fact is the interest in starting vegetable gardens by adult ryots. They have watched the boys in their Young Farmers' Club gardens and many have decided to follow suit.

In addition to their project activities, these young people are also trained to become leaders and volunteer workers in village improvement programmes and to spread the gospel of better farm and home practices among their families and neighbours.

On 1 March, 1953, 37 Clubs with 566 members had been established—all in about seven months. This fine showing is a credit to the initiative and resourcefulness of the entire Malavalli Extension staff. One of the greatest needs in rural India today is local leaders—men and women with open minds who are interested in community development rather than personal prestige and financial gain. One of the main functions of extension work is to locate and develop these leaders without which the progress of any community is retarded. Let us never forget that Extension work basically is educational—it is teaching by inspiration and show-how rather than by dictation.

 (*Contd. from page 19*)

ment of fibre on account of reform in two directions. There was a general misconception among the balers and shippers that the quality of the various grades varied according to the quality of each season's crop. Obviously it went against the very object of grading and standardization, and therefore, had to be corrected.

Secondly, there was a deliberate attempt at putting as much as possible of the lower grades into the higher ones with the result that the out-turn of the higher grades was considerably inflated. This had also to be put a stop to.

The Agmark Sann Hemp Grading Scheme has improved considerably the standard of packing of Indian sann hemp and consumers are assured now of the quality of the product they obtain.

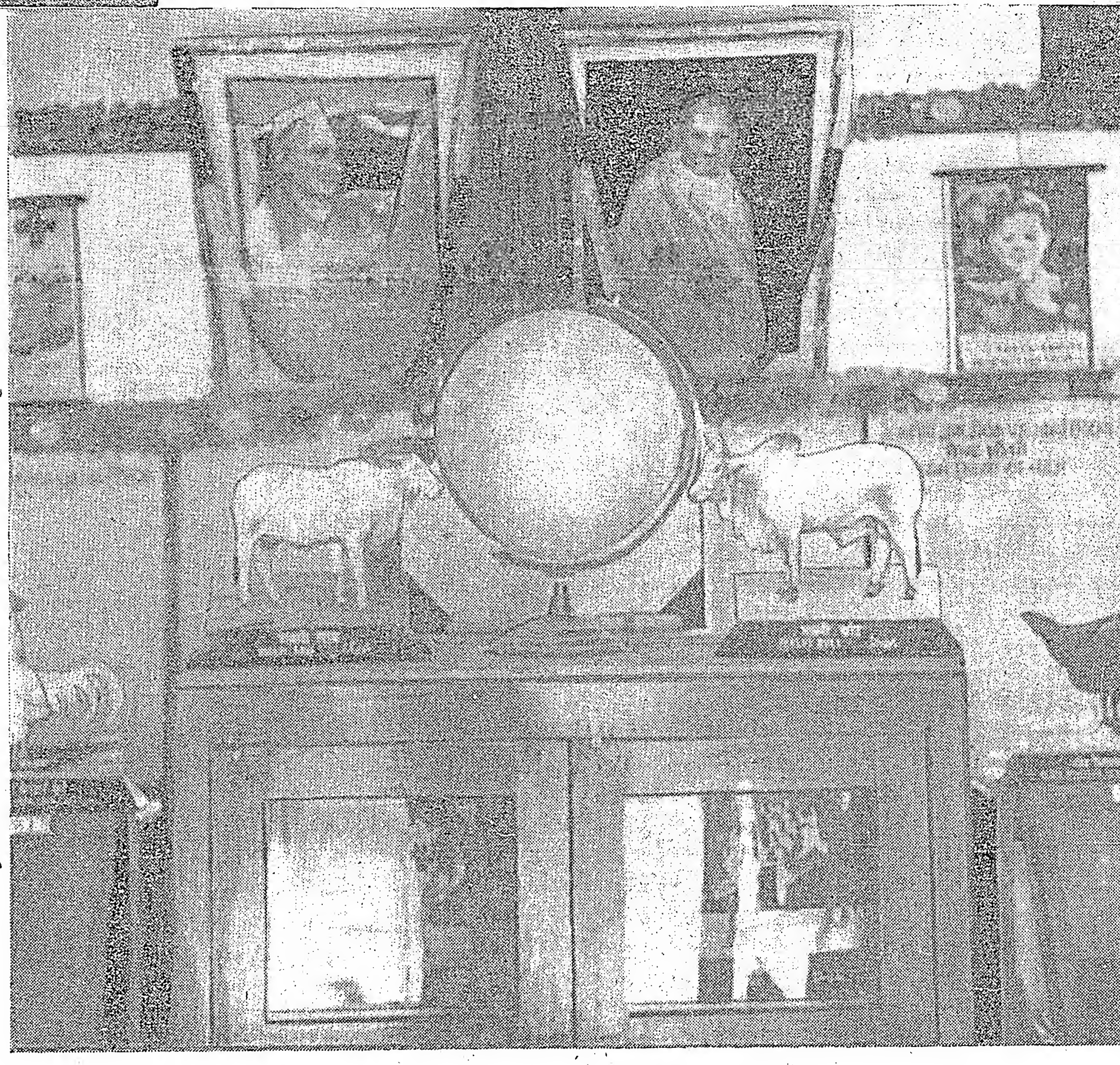
QUESTION AND ANSWER

Q. The hemp growers in the western belt of Orissa who grow hemp in large quantities for seed and fibre find it difficult to extract the fibre. The necessity of a mechanical device for the extraction of fibre is, therefore, increasingly felt by every one. Could you enlighten us about any such machine, its working, price and place of availability? (K.P.N.)

A. Fibre extracting plant, imported from Japan will be a great help to the process of extracting hemp fibre. The specifications of various units of plant are given below:

1.	Fibre softening machine	1 set	Rs. 1,435
2.	Fibre thrashing machine	2 sets	Rs. 426
3.	Washing agitator	1 set	Rs. 273
4.	Peeling machine	4 sets	Rs. 357

They are imported at the F.O.B. prices as noted against each. Incidental charges, i.e. packing, forwarding, handling, etc. are about 40 per cent on F.O.B. prices. The machinery is power-operated and cannot be converted into treadle one where power is not available. The working of the machinery is, however, very simple.



An interior view of the Museum

GOVERNMENT EXTENSION TRAINING CENTRE, ANTRI

THE Antri Training Centre, Madhya Bharat is situated in a village 20 miles away from Gwalior. It started functioning in November, 1952. One batch of 60 trainees has already successfully completed the course. They have been appointed in Dabra and Rajpur Community Projects and also in Mohow Pilot Project and Bhilsa Intensive Cultivation Block in this State. The second session started on 15 June, 1953. So far 65 trainees have been admitted.

The Centre has achieved outstanding success in all the spheres of training it has undertaken to impart. The system of training is one in which the trainees have to do all the work with their own hands.

The daily programme begins at 5 o'clock every morning with the prayer "Oh Lord, give us strength to fulfil our mission and our duty......" and hoisting the national flag. Thereafter, the whole class is divided into two batches. One batch goes to the villages to receive practical training and the other attends the theory classes. The trainees disperse for lunch and rest at 11 A.M. The second shift starts from 2-30 P.M. and continues to work up to 5-30 P.M. The batch which goes for field work in the mornings attends theory classes in the afternoons and the one which receives theoretical instructions in the mornings, does practical work in the fields in the afternoons. The trainees also stay overnights in villages twice a week for organizing social work, adult education and other similar activities. The subjects in which the trainees are given lessons in the classes are agriculture, horticulture, plant protection, animal husbandry, health and sanitation, first aid, cot-

Trainees doing plant protection work

tage industries, cooperation, social and adult education, Extension methods and ways of securing villagers' participation, etc. The lectures are illustrated with suitable charts, posters and diagrams.

PRACTICAL TRAINING

The practical work in the villages consists of cleaning of streets, lanes and drains, preparing soakage pits, compost pits and filling them with raw material, vaccination against small pox, castration of bulls, administering medicines to the patients, spraying with D.D.T., demonstration of crops in the fields, constructing roads and organizing social and education activities such as *bhajans, kirtans*, dramas, literacy classes, games, group discussions, film shows, exhibitions, fairs, etc. Small exhibitions are also organized on the occasions of public fairs, etc. In addition to the work indicated above they also organize other activities according to the felt needs of the villagers as and when necessary to help the people to help themselves.

STAFF

The teaching staff consists of one Principal and seven instructors one each for agriculture, horticulture, health and sanitation, animal husbandry, cooperation, and social education. All are qualified, trained and experienced men.

OTHER FACILITIES

The hostel comprises of dormitories in an old but big building where all the trainees reside. A spacious dining hall is attached to the hostel where all the trainees take their meals together. The staff also resides in the same building. This living together helps the trainees to develop a sense of corporate life and also to organize themselves for any unified activity which is an integral part of the training programme. Thus they learn to work together and also learn to live a democratic way of life. They manage their own affairs themselves and the staff helps them only when such help is imperative.

The Centre has got a well-equipped workshop in which training is given in cottage industries; practical instructions are imparted in spinning, weaving, *niwar* and carpet making. The Centre has a Museum where interesting and instructive exhibits are kept. There is also a small library which is used both by the trainees and the instructors.

A small plot is also attached to the Centre where the trainees are given practical training in agriculture and horticulture, and where they also grow seasonal vegetables for their daily use.

TRAINEES

The largest proportion of trainees is derived from sons of actual farmers. Most of them are matriculates, while others have passed middle class examination. All of them are quite healthy and are capable of doing hard work in the field. Selection of trainees is held at Gwalior, Indore and Rajpur every six months by a selection committee specially constituted for the purpose. Only those who possess qualities which go to make a successful Village Level Worker are selected.

Well-looked after and healthy Bikaner lambs at weaning age

CARE AND MANAGEMENT OF LAMBS

By S. JAYARAMAN and B. B. BUCH

THE importance of proper rearing of lambs is sadly neglected in our country. This is mostly due to lack of knowledge. Lambs are, in fact, the future adults and form the foundation stock, and if each newborn lamb is treated as such, and a little extra care is bestowed upon it, the sheep industry would be a very lucrative one. Care bestowed in the early years never goes unrewarded. It will not only help in bringing up healthy lambs in greater numbers but will also help in augmenting the productive value of the entire flock.

The lamb, just as any other young mammal, requires enough mother's milk for its proper growth and well-being. Failure to provide ewes with nutritious grazing during the last six to eight weeks of pregnancy eventually results in a drop in the milk yield besides the lamb being underweight and weak at birth. This is why the fertility percentage in village flocks is deplorably low.

CARE OF THE NEWBORN LAMB

Sometimes a newborn lamb does not breathe. In such a case it may be rubbed quickly with a wisp of straw or an old sack, slapped firmly on the breech portion and then given artificial respiration by pressing its chest in and out alternatively, at intervals of a few seconds. The lamb must have warmth and shelter without delay and may easily be revived as long as its heart continues to beat. A newborn lamb should never be carried by the forelegs.

After a lamb is born, it should be kept by the side of its mother for 24 hours. In no circumstances should they be separated even for a short while. Such a separation might result in the ewe disowning the lamb. The lamb is usually able to stand up of its own in about two hours unless it is too weak. By this time it is also able to suckle. Weak lambs, however, may be helped to suckle. The udder and teats of the ewe must be kept clean.

It is highly essential that lambs must get the colostrum or the first milk soon after birth. It contains very essential nutrients as vitamin A and proteins. In addition to these, it has those properties which the ewe's blood has acquired in resisting infectious diseases and which in turn makes the lamb resistant to infection.

Lambs depend entirely on the milk of their mothers for the first month of their life. During the first month they must be kept in their respective pens and should be provided with adequate shade and clean drinking water. The ewes may be allowed to go out for grazing in the morning and brought back to the pens for an hour or so during the mid-day to enable their lambs to suckle, since the interval between the morning suckling and evening suckling will otherwise be too long for the young lambs. Lambs should not accompany the ewes when the latter go out for grazing for fear of their being not able to keep pace with their mothers and getting lost in the grazing fields. Moreover, the rain or heat during the day time

will be uncomfortable and unbearable to the lambs dropped prior to the rainy or summer season.

ORPHAN AND DISOWNED LAMBS

Orphan lambs, as the term implies, are lambs which have lost their mothers at the time of birth or shortly thereafter. Disowned lambs are those which are not fostered by their mothers. Disowning might arise due to any of the following causes:

1. The lamb might be extremely weak and may not be able to suckle.
2. Maiden ewes might sometimes disown their lambs due to lack of motherly instinct.
3. A decrease in the flow of milk in the ewe due to scarcity conditions during pregnancy and the lambing season.

Disowned lambs and orphan lambs require more care than the natural lamb crop. If disowning is due to weakness of the lamb, the lamb should be helped to suckle the ewe at frequent intervals till it gains enough strength possibly in three or four days' time. If it is unable to suckle even on being helped, its mouth may be kept open and small quantities of milk stripped into its mouth direct from the teats. At the same time, care must be taken that only a small quantity of milk is drawn slowly at each stripping. Haste or stripping larger quantities will result in respiratory complications which may prove fatal to the lamb. Alternatively milk may be drawn in a clean receptacle and given to the lamb with the help of a swab of cotton wool. A feeding bottle may also be used but with care. Cleanliness of the bottle and the nipple is an absolute necessity at all times. With sincerity of efforts and adequate feeding at frequent intervals, many lambs born weak can be easily saved. The lambs, however, must be allowed to suck by themselves at the earliest opportunity.

To remedy disowning of lambs by maiden ewes and habitual disowners, it is always necessary that the lamb and the mother should not be separated from one another. In such cases they may be put in a separate pen and a dog may be brought near them. The bark or even the presence of the dog is enough to create fright in the mother and arouse her motherly instinct when it may take up the lamb at once. Among the shepherds it is a common practice to take some mucous from the mouth and nose of the newborn lamb and smear it over the nostrils of the mother. If these methods fail, the ewe may be held by an attendant, or its forelegs may be tied together, and the lamb allowed to suck the milk forcibly. This procedure may be repeated at regular intervals till the ewe takes up the lamb.

If the lamb is disowned by the ewe owing to dearth of milk arising from shortage of feed, the ewes require nutritious green feed for increasing the milk flow. At the same time, the ewe may be held by an assistant and the lamb allowed to suck. Extra green feed given to the ewe may be discontinued soon after the lamb is able to graze.

Orphan lambs deserve a different treatment. All efforts must be made to put them to a foster ewe. It is preferable to transfer them either to an ewe which has lost its lamb recently or to an ewe which has a good flow of milk. The best procedure will be to transfer it to an ewe which has lost one of its twin lambs. If the ewe be one that has lost its lamb, deception in the sense of smell is an effective approach. It is a good procedure to put the pelt of the dead lamb on the back of the orphan lamb. The ewe and the lamb must be confined together in a small pen or placed in a stanchion permitting the lamb to nurse frequently. Another method is to milk the ewe and apply the milk on the back and rump of the orphan lamb and also on the nose of the ewe.

If all these methods fail, the last resort may be made to artificial feeding. This method may be carried out with the help of a feeding bottle. If ewe's milk is available, it is the best. In the event of lack of sufficient ewe's milk, the next best is cow's milk. It is preferable to give cow's milk as such rather than add fat or sugar in order to imitate ewe's milk. The milk must be fed at body temperature and in small quantities. On the first day two tablespoonsful fed after every two hours will be enough. The quantity may be increased gradually and the number of feedings decreased until about three weeks of age when six ounces of milk four times a day will do.

AFTER A MONTH

Lambs may be sent out for grazing when a month old. In the beginning they should not be allowed to go too far. For the first ten days during this period, they may be allowed to go out for grazing only in the evenings. Subsequently they may go for grazing for the whole day. They must also be given similar marks, as their mothers have, with the branding fluid to identify their respective pens. This must be done before allowing them to go out for grazing.

GENERAL MANAGEMENT

The general management of lambs includes tail docking, castration of ram lambs, weaning and the treatment of ordinary ailments.

Tail docking is the removal of the tail leaving a stump and is necessary only in the case of long-tailed breeds. It should preferably be done after one to two weeks of birth, as tissue growth is then very rapid, and healing is promptly accomplished. Docking is best performed with a sharp knife or with the help of a docking iron. The stump left out must be just enough to cover the vulva in ewe lambs and of about the same length in ram lambs. If the hot docking iron be employed for the purpose, it is advisable to place the tail in a slot in the end of a board or put it through a hole in a board prior to docking by the iron. If the board is an inch thick it not only serves to protect the hinder parts of the lamb from heat but also serves to measure a suitable length of dock. Instruments that are used cold include a sharp knife or a scissor-type emasculating instrument. Healing is quicker if docking is carried out with the aid of sharp instruments rather than by the hot iron. The after-treatment generally consists of only in the application of an antiseptic immediately. The lambs must be retained in the pens for about a week when all care must be taken to see that no soiling on and around the dock occurs. If it becomes dirty, the portion may be washed with antiseptic lotions and kept clean. Healing is uneventful.

Castration of ram lambs is best performed when they are four or five months of age soon after wean-

(*Contd. on page 32*)

LOOSE-BOX METHOD OF COMPOST MAKING

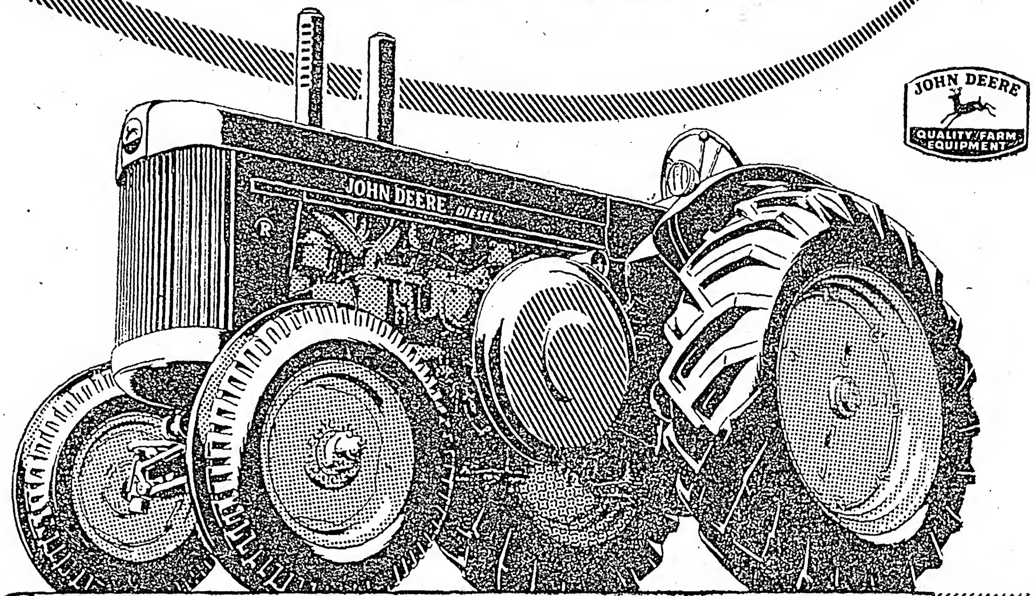
By R. SPECK

I HAVE two cows, three bullocks and three calves. They are living in a shed ten yards long and five yards wide. We do not tie them up there, but simply close the gate with two wooden beams. Into this shed we throw all rubbish of vegetarian origin—leaves, weeds, grass and straws of every sort. Last time we did not clean this room for six months. A heap of material, three feet high, thus collected there. The upper layer, about three inches thick, was almost completely dry. But below, the stuff was nicely moist and decomposed. The cattle slept on the dry top as comfortably as on a nice bed. The shed remained completely free from any bad smell. Flies were conspicuous by their absence. The cattle did not get dirty except when they slept on fresh dung, but this happens in the cleanest dairy farm too.

In this way, 450 c.ft. of compost were collected from eight cattle (three calves) in a period of six months. I think the compost prepared in this way is of the best quality because the urine and dung passed by the cattle during the night all go into its making. The decomposition is slow because the material is trodden hard and very little air can move in. The stuff does not get hot. In my country, Germany, no one allows to get his material hot for they say it results in a huge loss of nitrogen. The compost prepared in this way is brought to the field directly from the shed in the month of June and ploughed in into the soil immediately so that all the nitrogen was retained in the soil. The result seemed to be good. The uppermost layer is, of course, left behind in the shed.

The lower portion of the material contains many worms, but they appear to be harmless. This method of bringing the rotten stuff directly from the shed to the field without allowing it to develop heat, i.e. decompose completely, has its own advantages. The stuff at the time of ploughing in into the field is half-decomposed so that a portion of the nutritive material is immediately available and the remaining portion is in the process of making in the soil to be ready in one or two months. Hence, in the event of heavy rains, even if a portion of the useful nutritive material is washed out, the other portion is not lost to the soil. The labour required for handling the stuff is almost negligible. Then all the urine is utilized although no special device or effort is made to collect it. In the dry areas where available leaves, etc. cannot be easily decomposed this method has a great advantage. And during the rains there is hardly any chance of the compost or any of its components being washed away.

The NEW JOHN DEERE MODEL R DIESEL



The most powerful tractor ever built by JOHN DEERE

You will like its PERFORMANCE

You will be convinced of its EFFICIENCY

You will benefit by its fuel ECONOMY

JOHN DEERE (R) *TRACTOR*

REPRESENTED IN INDIA BY

CALCUTTA	BOMBAY I	NEW DELHI
TRACTORS (INDIA) LIMITED	**LARSEN & TOUBRO LIMITED**	**WILLCOX (BUCKWELL-INDIA) LIMITED**
P. O. Box 323	**P. O. Box 278**	**P. O. Box 289**

AFTER SALES SERVICE—3 free service visits in first six months of JOHN DEERE ownership. Also large stock of spares available at reasonable prices.

MENACE OF ADHASIS

(*Contd. from page 17*)

'ADHASIS'—MOST UNWANTED PLANT

Adhasis is widely distributed. It is distributed throughout the hotter parts of India and Ceylon, usually nearer houses, ascending the western Himalayas to 5,000 feet.

The medicinal properties of *adhasis* should not lead us to think that it is a useful plant. It is the most unwanted plant which is menacing the rich pasturages of the country and smothering the good grasses which go to feed the bovine population. Of late, it has assumed alarming proportions in Madhya Bharat and some other States of India and is spreading like wild fire. It is no longer confined to areas around the houses but is to be found everywhere on the roadsides, along railway tracks and in railway yards, on pasture-lands, on hills and hillocks, in ravines and on the banks of rivers and brooks. It is found most commonly on field borders, in neglected gardens and in back-yards and frontages of bungalows. What once were green pasture lands are now covered with this pernicious weed. It has covered most of the countryside and is causing grave shortage of hay and is telling on the health of cattle. Luckily the reserve forests and reserved grass lands are free from it, but it is slowly encroaching on them. If early action is not taken to exterminate this weed, a serious situation is bound to arise. The menace of *adhasis* is looming large and *adhasis* is on the forward march. This onward push of *adhasis* has got to be checked immediately and in due course it has to be brought under control.

Adhasis was not so widely prevalent some twenty years ago. Some of the elder villagers distinctly remember that their field borders and pasture lands were free from this weed. They tell us that this troublesome weed has come from arid Rajputana along with the herds of sheep and call it by an alternative name of *bhed chitchita* (meaning which sticks to the fur of sheep).

ERADICATION OF 'ADHASIS'

Luckily *adhasis* can be eradicated easily. The surest way to eliminate this weed is to uproot the plant or to mow it before it forms seeds. If it is found growing in the fields, the fields can be ploughed by a soil-turning iron mould-board plough during the rainy season and if it is found growing among the *kharif* crops, a hoeing followed by hand-weeding will free the field from this obnoxious weed.

But, to eradicate *adhasis* from roadsides, field borders, rail tracks and pasture lands is a colossal task where mowing and uprooting the plants by manual labour or killing them by the use of selective hormone type weed-killers are the methods of eliminating the weed. A coordinated herculean effort on a gigantic scale, accompanied by mass propaganda and mass awakening, is needed to bring this pernicious weed under control. In this movement, which should be spontaneous, all should cooperate. Then only this menace of *adhasis* can be brought under control.

Organized Government bodies like the Public Works Departments and the Railways can conveniently use selective hormone type weed-killers like the Fernoxone. Manual uprooting of the plant, though tedious and time-consuming, is within the reach of all.

The most appropriate time for uprooting and spraying *adhasis* will be the month of August when the plants have developed sufficient leaves for spraying them with hormone type weed killers. This time is also suitable for mowing and uprooting the plants as they are easy to pull and easy to cut and have not formed seeds. The mowed and uprooted plants can be very conveniently composted in compost pits in the usual way.

Adhasis seedlings are said to be poisonous to livestock especially when they are grazed in the cotyledonary stage. The swine are reported to be more susceptible to *adhasis* poisoning than sheep and cattle. Usually the cattle do not touch the adult plants as both the leaves and stems of *adhasis* are bristly and unpleasant to touch. However, goats and donkeys have been observed to nibble at a leaf or two.

The time has come when this menace of *adhasis* has got to be removed somehow. Any delay will tell severely on the health of our cattle and will cause serious grass and fodder shortage.

MAN OF THE MONTH

(*Contd. from page 6*)

strings. It is no wonder that when it was harvested at the end of November last year, the yield was over 200 md. an acre! He has been adjudged the winner of the first prize of Rs. 1,000 for paddy in last year's *kharif* crop competitions of the Bombay State.

I was keen to know the economics of this record-breaking yield of paddy. My host had his figures ready. His total expenses came to Rs. 1,150 and the income was a little over Rs. 2,600, which meant a net profit of over Rs. 1,450 per acre. It was interesting to learn that the heaviest items of expense were, in that order, cost of transplanting, well irrigation and compost manure.

Before we left village Shivre, I asked Shri Laxman Gopal Mali what he would do with the Rs. 1,000 when he got them. "I will improve the village roads", he replied.

A laudable ambition, I thought, for the roads—or what passed for them—were in a deplorable state.

WEALTH FROM TOBACCO WASTES (Contd. from page 15)

nicotine sulphate according to the types of tobacco. This is a powerful insecticide and is at present entirely imported at a cost ranging from Rs. 50 to 95 per lb. A cheap plant to extract nicotine on commercial basis from tobacco waste has been recently designed by the National Chemical Laboratory of Poona.

About 38 million lb. of tobacco waste are almost annually destroyed in India. Besides, about 25 million pounds of stem which, perhaps for its limited use in blending with *hookah*-tobacco or in adulterating *bidi*-tobacco, are of little use. The cost of these together is roughly estimated at Rupees two crores which has so far been more or less a national loss. With the manufacture of nicotine sulphate from the waste not only this loss will be saved but India will also be able to conserve foreign exchange expended on imports of nicotine sulphate.

The possibility of extracting potassium sulphate, a very valuable manure, from the stalks of virginia tobacco is already under consideration. This fertilizer is also at present imported into India from Europe at about Rs. 500 a ton. Annually about 60,000 to 80,000 tons of this manure are imported from abroad for manurial and other chemical purposes. If the extraction of potassium sulphate proves successful and economical on a large scale, it will be a step forward in our home industry.

From the foregoing account it will be obvious that the economic utilization of these by-products which are at present of little market value, even on modest cottage industry scale, can yield premia and will employ manual power, relieving to a certain extent the problem of growing unemployment in the country. It will also provide employment to tobacco growers and other agriculturists in their off-season when the agricultural operations are slack or at stand-still.

CARE AND MANAGEMENT OF LAMBS (Contd. from page 27)

ing. The use of the Burdizzo Castrator is undoubtedly easy and safe. It crushes only the cord that suspends the testicles leaving the testicles in the scrotum. The testicles get shrunk in due course as a result of the cutting off of the blood supply.

Constipation is a common trouble experienced in young lambs. Castor oil in doses of one to two teaspoonsful will relieve this condition. In some cases, faeces get collected about the upper part of the tail in a great mass causing constipation. The collected mass should be removed by scraping and washing; this will relieve constipation.

Sore eyes are best treated with a warm boric lotion wash of the eyes after which a drop or two of argyrol may be instilled into the eyes. Most of the maladies of young lambs are better prevented than cured.

Weaning of lambs means separation from their mothers. The best time for weaning is at four months of age. Special care is necessary at the time of weaning. Ewes with good flow of milk may develop udder trouble due to accumulation of milk in the udder. The udders may have to be watched and the milk drawn out to afford relief in such cases. Once weaned, the lambs should definitely be kept away from their mothers at all times for about two weeks to allow the milk to dry up completely.

Another safe practice is also recommended for the weaning of lambs. It involves a gradual separation of the lambs from their mothers. They may be separated for about twelve hours daily in the first week and then gradually this period of separation may be increased till they are completely weaned in about three weeks' time.

It is always advisable to wean lambs in batches at intervals as they are born so that any ill effect on the ewes may be controlled efficiently.

"A lamb is a delicacy to wild animals including wild cats. Great care, therefore, should be exercised to prevent untoward losses from the ravages of wild animals. The fencing and the gates of the pens should be sufficiently secure. While lambs are taken out for grazing with their mothers, the shepherds should be very watchful.

INDIAN FARMING

Vol. III New Series No. 9 Dec. 1953

EDITOR'S PAGE AND EDITORIAL NOTES .. 2
MAN OF THE MONTH (Feature Article)—A. R. Vyas .. 4
SUGARCANE LEAF HOPPER —E. S. Narayanan .. 8
SHEEP FARMING IN RAJASTHAN .. 10
USING LONG RHIZOMES FOR CARDAMOM PLANTING—G. Pillai 12
SEEDLESS PAPAYA—B. L. Choudhari 14
COW-DUNG GAS PLANTS —C. N. Acharya .. 16
A NEW ECONOMIC 'JOWAR' —Ponnaiya and Anavaradham .. 19
RUST-RESISTANT WHEAT VARIETIES FOR SAURASHTRA —V. T. Motwani .. 21
SOME ACTIVITIES OF THE INSTITUTE OF PLANT INDUSTRY, INDORE—Sardar Singh .. 22
A REFERENCE TO TRANSPLANTATION OF PADDY (KALAMA) IN KALIDASA'S RAGHUVAMSA .. 23
AGRICULTURAL WORK IN JAMMU AND KASHMIR—Jia Lal Raina .. 24
FISH CULTURE IN TRIPURA STATE —Bannerjee and Mukherjee .. 28

★

EDITORIAL BOARD

Printed and published by P. H. Raman at the Associated Advertisers and Printers Ltd., 505, Arthur Road, Tardeo, Bombay 7.
(Agents for Indian Council of Agricultural Research, New Delhi.)

ADVERTISEMENT RATES

CURRENT:
CASUAL

Full Page	Rs. 450/-
1/2 Page	Rs. 225/-
1/3 Page	Rs. 150/-

CONTRACT CONCESSIONS:

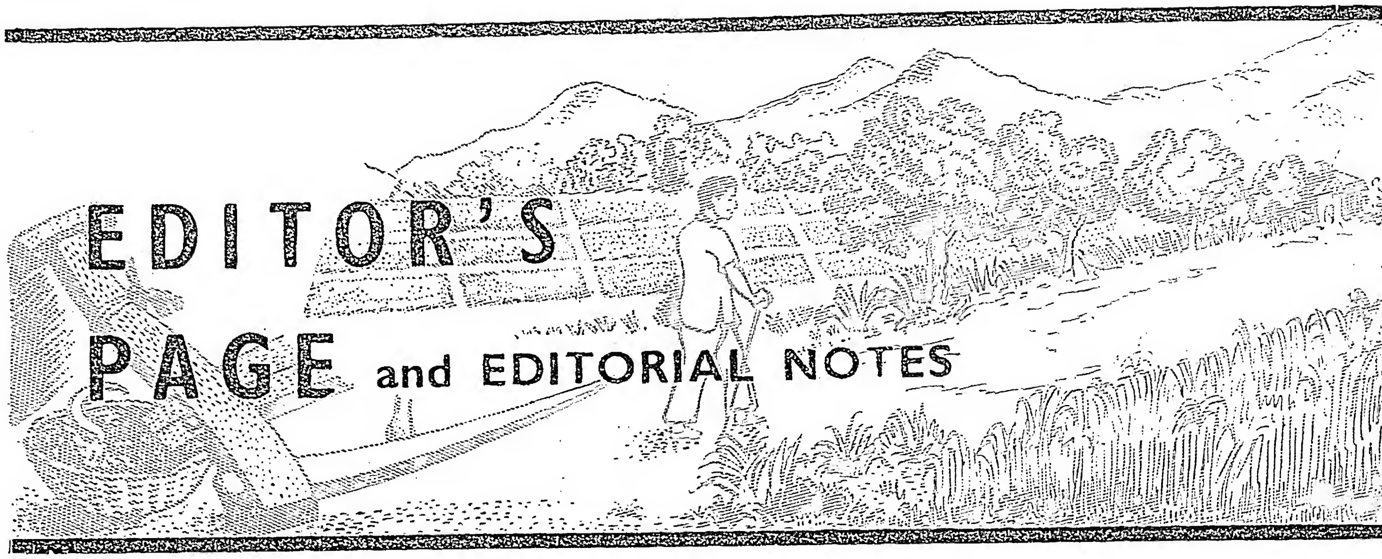
6 INSERTIONS	12 INSERTIONS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

Effective from October 1952 until further notice.

SUBSCRIPTION RATES

Annas 12 only per copy
Rs. 9-0-0 for 12 issues
Rs. 4-8-0 for 6 issues

All Business enquiries may be addressed to the "Agents" at 505, Arthur Road, Tardeo, Bombay 7.



The Census Reports of this country have always been interesting not only as a record of data relating to population but also because of the variety of information they contain. The first volume of the Census Report for 1951 which has recently been published contains thought provoking material and should be accorded due consideration by all interested in the country's well-being. It appears that at the present rate of population growth, the rise in number will be from 36 crores in 1951 to 41 crores in 1961, 46 crores in 1971 and 52 crores in 1981. The population growth in any country is vitally connected with the problem of food supply. The larger the number of people, the greater evidently will be the demand for food. Consequently, if India has a larger population, her food requirements will also inevitably be greater. And in the case of an unstatic, growing population, the resources ensuring food supply should be capable of corresponding adjustment.

It is expected that by 1969 the population of India is likely to be in the neighbourhood of 45 crores. It is believed in some quarters that this number represents the saturation point, because the agricultural and general resources of India cannot support a population more than that level.

Of course all the resources and services are required to be geared up to face problems created by a growing population. But the prime necessity is food and it should be made available to as many mouths as are added. With regard to the food front two courses are obviously open to face the situation. One is to restrict and limit the number of people to the level that can be properly and adequately fed, the other is to increase the food production commensurate with the rise in population.

Obviously, restriction or limitation of population involves a long range programme. It is also a matter of high level policy and the authorities concerned may or may not decide in its favour. If and when this programme or policy is accepted the desired result cannot be achieved without the willing co-operation of the people. Whether this course can at all be adopted is open to doubt at the present level of economic, social and moral consciousness of the people. The question is, however, an important one which claims attention of all persons interested in the country's welfare.

The agriculturist has clearly a responsibility in the matter of facing the food problem brought about by the contemplated increase in population. The stepping up of production from the soil falls to his share to a great extent. It is for him to show he has the potentialities and power to undertake the task. He should make the best possible use of his knowledge and experience of crop and animal husbandry. All the uncultivated lands, suitable for cultivation, should be brought under the plough. The factors which stand in the way of putting such lands under cultivation should be eliminated. With sui-

table facilities for irrigation, supply of manures and fertilizers, seeds, etc. much of the marginal lands which are outside the pale of profitable agriculture at present might be utilized for food production.

Not only the agriculturists toiling in the field, but also the technical research workers engaged in laboratories, experimental plots and demonstration farms have as well to put in their efforts. It is they who would evolve better techniques and help the farmer to grow more. Efforts should as far as possible be made to tune research work in the field of agriculture to projects expected to yield results of immediate value for stepping up food production.

Production is not an end in itself. The produce should be put to the maximum utilization. All channels of waste should be eliminated and preservation and storage methods perfected so that the yield of a plentiful season may be made available in periods of adversity.

The food-population relationship is a complex problem. A great deal of thought, planning and research is necessary to solve it. It is possibly a problem for every one, and it can be solved only by joint efforts of all concerned.

Gosamvardhana or Cattle Welfare Week was celebrated for the second time in this country with great enthusiasm from the 7th to the 14th November, 1953. During this period conferences on cattle problems, exhibitions of cattle breeds and various kinds of feeds, dairy equipments, etc. were held. Improved technique of cattle husbandry was stressed at these conferences and shows. The celebration attracted a large number of people and the programmes were very much appreciated. The Cattle Welfare Week was successful in focussing the attention of the people to the problems of cattle improvement in this country. It thus served the purpose for which it was organized.

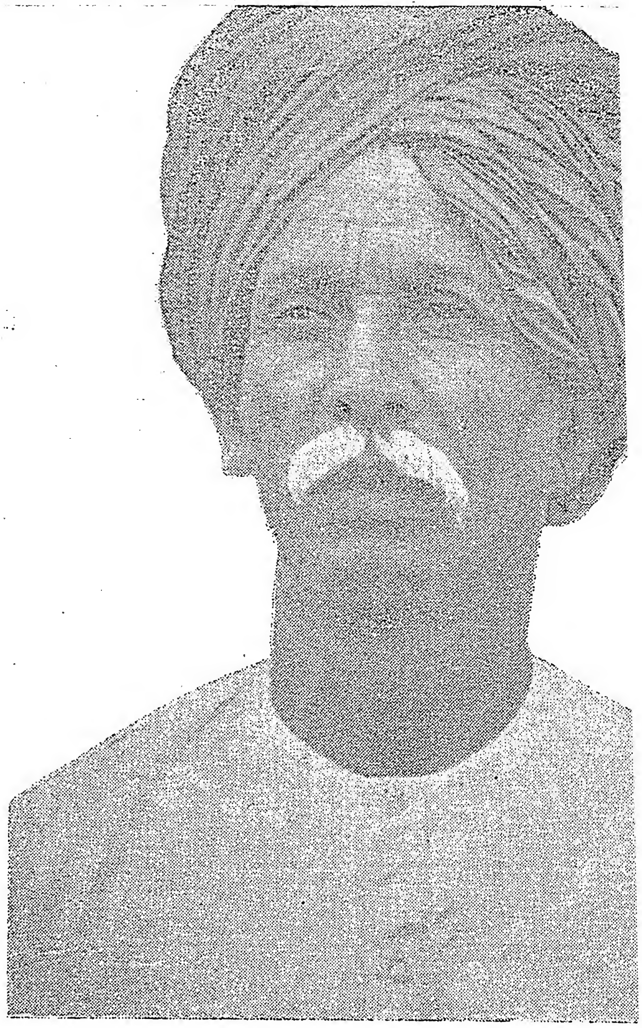
India has nearly 195 million head of cattle. This large number constitutes nearly a quarter of the world's total bovine population. From time immemorial the cattle has been intimately associated with agriculture in this country. The position that livestock occupies in India is, therefore, a unique one. Cattle has even influenced and moulded the social and economic life of the people in this country. Unfortunately, however, cattle has long been neglected in India. Instead of a genuine scientific approach to solve the problems relating to cattle, sloppy sentimentalism has found its way. In order to ensure the well-being of cattle in this country, a special organization known as the Central Council of Gosamvardhana was set up in the Central Ministry of Food and Agriculture in August, 1952.

The Council has undertaken a number of projects for improvement of cattle. For example, it has taken up the reorganization of the existing *gaushalas* which number about 3,000 and maintain over 600,000 cattle. The survey has revealed that these institutions have vast potentialities for increasing the number of pedigree bulls and stepping up milk production.

MAN OF THE MONTH:

By

A. R. VYAS



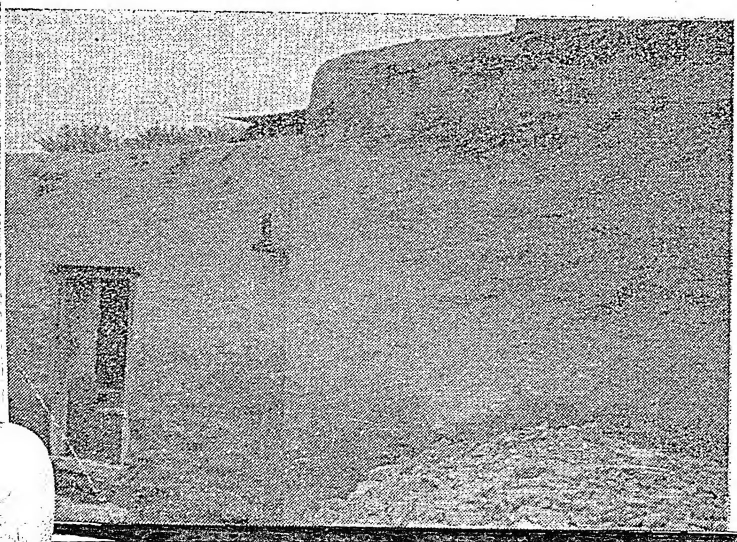
Shri Kallappa Bharma Chougule

SOUTH Satara farmer, Shri Kallappa Bharma Chougule has had two ambitions in life: the first was to raise a record crop on his land, and the second to give his only son the best possible education. The year 1953 has seen the fulfilment of both these desires: this 57-year old farmer has won the first prize of Rs. 1,000 for his record yield of 8,640 lb. of *jowar* on an acre of land in the 1952 *kharif* competition of the Bombay State, and his 23-year old son has been successful this year in the I.A.S. competition. Both father and son are men in the service of the nation; the older has grown grey in the field of agriculture and the younger has just started his career in the country's premier administrative service.

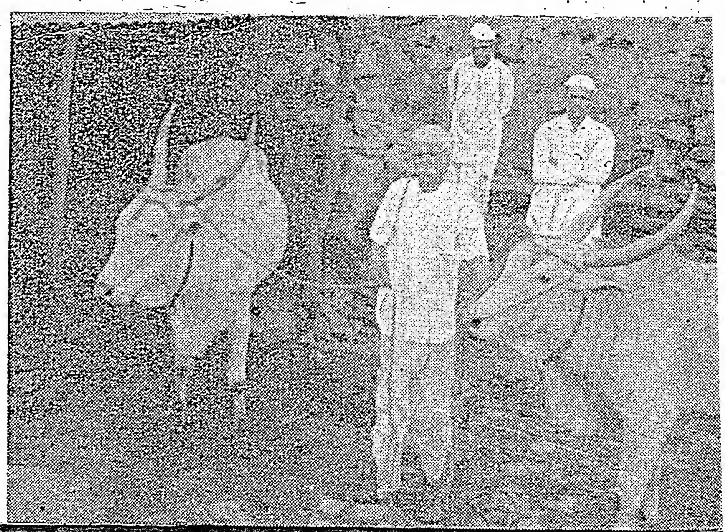
I met Shri Kallappa Chougule last September at the town of Sangli in the Bombay State. Together we drove to his village Ashta about 12 miles away from the district headquarters. Ashta, I was told, is one of the oldest municipalities having come into existence in December, 1853. Now when it celebrates its centenary, increased fame has come its way through the efforts of Kallappa. An interesting story was told to me by the District Agricultural Officer of the prosperity of the farmers of Ashta even a hundred years ago. The name of one of the Ashta farmers had, it is said, for some unaccountable reason been omitted from the list of land revenue assessees.

South Satara Farmer

The house where Shri Kallappa lives



Shri Chougule with his pair of bulls



It took a couple of years before the mistake was detected, and when this happened, a prompt demand was made on the farmer for a payment of Rs. 1,25,000 as arrears of revenue. The amount was paid at once! That is the tradition of village Ashta.

Shri Kallappa is a colourful personality, interested wholly in his land and his son. Broach the subject of either, and his beady eyes light up in a genial smile which adds charm to his wrinkled face. While our bus bumped its way over the stony road, Kallappa told me of his work on the land, and the improvements he had made almost single-handed. And most of the income from the land went to maintain his son in schools and colleges.

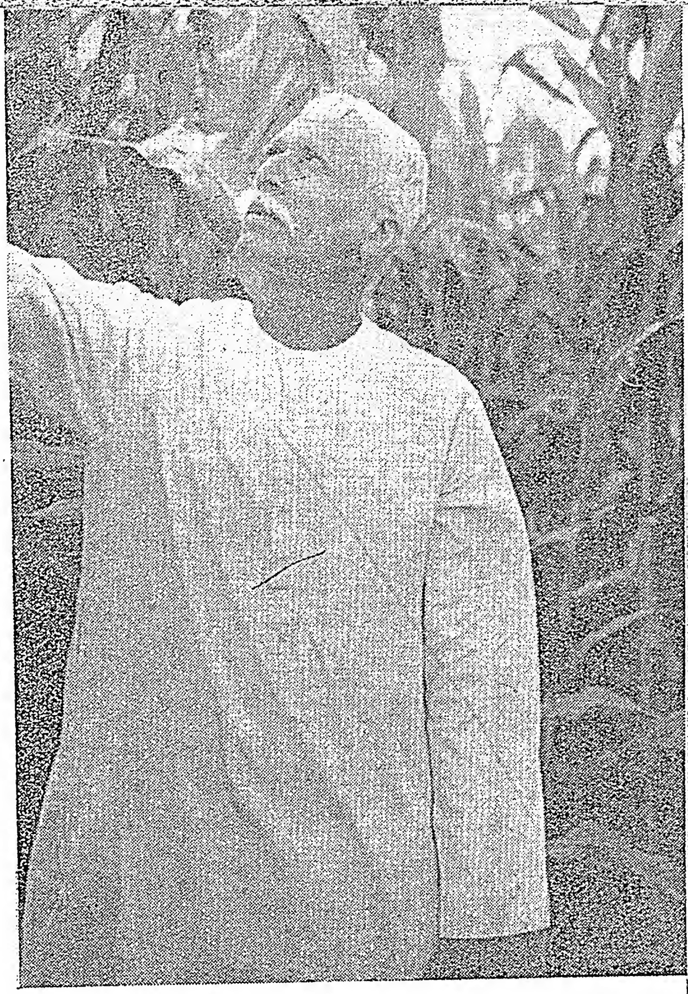
METHODS USED

Behind Shri Chougule's success in raising a record *jowar* crop lies 15 years of painstaking effort to improve his land and its yield. He showed me the bunds he had raised, the system of conserving rain-water he had adopted and the improved implements he had experimented with. "And all this with my own hands," he repeatedly told me, and to emphasise his point, he showed me his rough, rugged hands and the gnarled fingers.

"I own 12 acres", he told me, "and the income from another two acres and 17 *gunthas*, is reserved exclusively for the maintenance of the village temple".

This strong trait of religion in Kallappa's makeup was to appear again later in the evening.

The one-acre plot which Shri Kallappa entered for the competition is of rich black soil. Earlier, it was under tobacco, and thus it was subject not only to a system of scientific crop rotation but it had had the benefit of heavy manuring. It was ploughed in

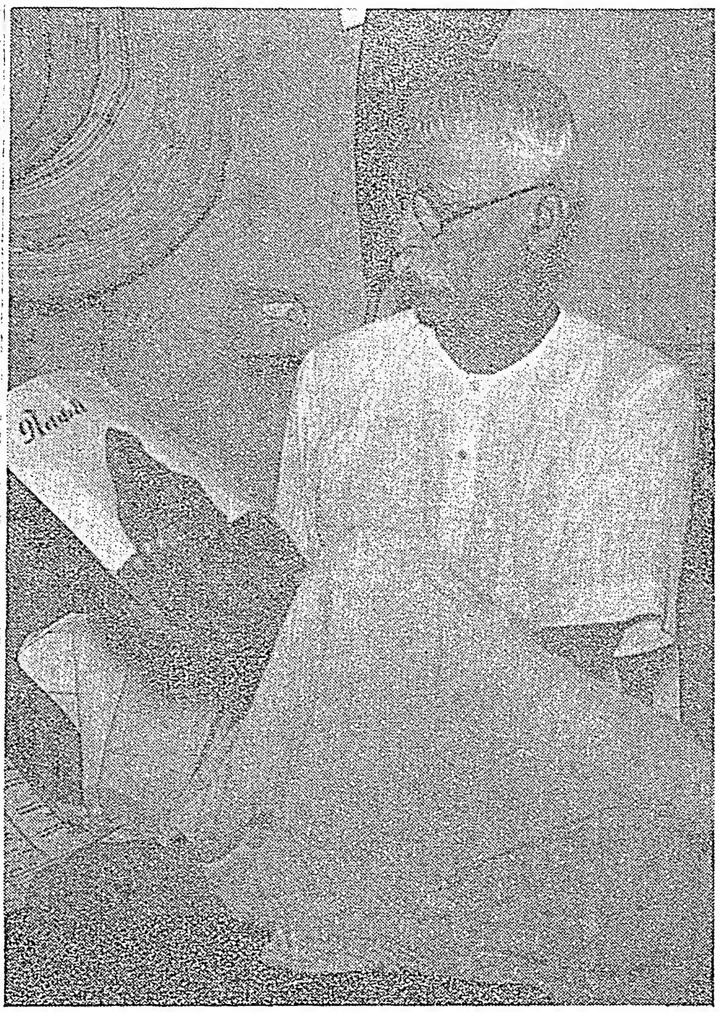


Shri Kallappa examines his 'jowar' plants

s Success in Life's Ambition

In the system of crop rotation followed by Shri Kallappa he grows tobacco, which is followed by a 'jowar' crop. Tobacco plants in the foreground with 'jowar' behind in Kallappa's field

One of Shri Kallappa's fields. Note the conservation of rain-water for irrigation and the bunds, all the work of this progressive farmer



Shri Kallappa Chougule is an avid reader of farm magazines in Marathi, his native tongue. A favourite is "Shetkari" published by the Bombay government

January, 1952 and after the summer rains, it was harrowed seven times at fortnightly intervals. Twelve cartloads of farmyard manure were applied to the land and "sheep folding" was practised on it. This method of manuring the land is common in these parts. Large numbers of sheep are kept in an enclosure on the land for a night or more. Thus all the drippings of the animals go to fertilising the field.

At the time of sowing in June, 160 lb. of manure mixture were used. The Mamdapuri variety of selected seed was sown at the rate of 6 lb. an acre and at a distance of 24 in. When the crop was about 6 in. high, the seedlings at a distance of nine to ten inches were retained and all the others were pulled out.

Weeding was done at an interval of 15 days each from after sowing till near harvest time. When the crop was harvested in the second week of December, the yield was 8,640 lb. This is nearly 1,700 lb. higher than the highest yield in the Bombay State in 1951 and over 26 times the all-India average for *jowar!* The net income on the yield worked out to over Rs. 650 for the acre. Shri Kallappa's yield in 1951 was 2,170 lb. for which he had secured the first prize for this crop at the *taluka* level. But in 1951, the yield was low, for the *jowar* crop had been spoilt by untimely rains.

CROP ROTATION

Shri Kallappa, who has studied up to standard VII in Marathi is a keen reader of farm magazines in that language, and admits that he has found them very useful in his crop growing.

He explained to me his system of cultivation, the manures he used and the rotation of crops that he practised. Before tilling the land, he applies 12 to 15 cartloads of farmyard manure to his land. For raising a tobacco or *jowar* crop he practises "sheep folding", at the rate of about 1,000 or more sheep per acre.

His first crop is groundnut in *kharif* intermixed with coriander. If the rains are good, he sows gram in the *rabi* season on the same land. If the moisture is insufficient, next year he puts the land under gram after the groundnut crop. After harvesting gram, tobacco is sown, which is followed by a *jowar* crop.

The Satara farmers grow *jowar kharif* in preference to sugarcane, because the latter requires a heavier investment, irrigation, and a longer wait than *jowar*.

CHOUGULE THE MAN

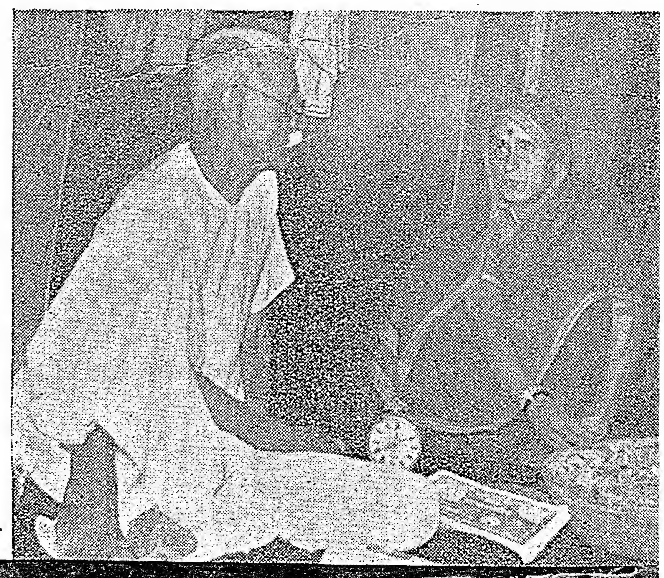
During lunch, I studied my host a little more closely and asked him a few questions about his daily routine. Though 57, Shri Kallappa Chougule has all the energy and buoyancy of a man in his forties. He rises every morning at four, attends to the needs of his cattle and by 6 o'clock he is out in his fields. His wife Shrimati Antu Bai joins him there a few hours later and by one o'clock in the afternoon, work in the fields is over. During the monsoon, Kallappa works in the fields during the late afternoon hours. When not in the fields, he is found either in the village library where he reads magazines and newspapers, evidly, or at home discussing agriculture with his wife.

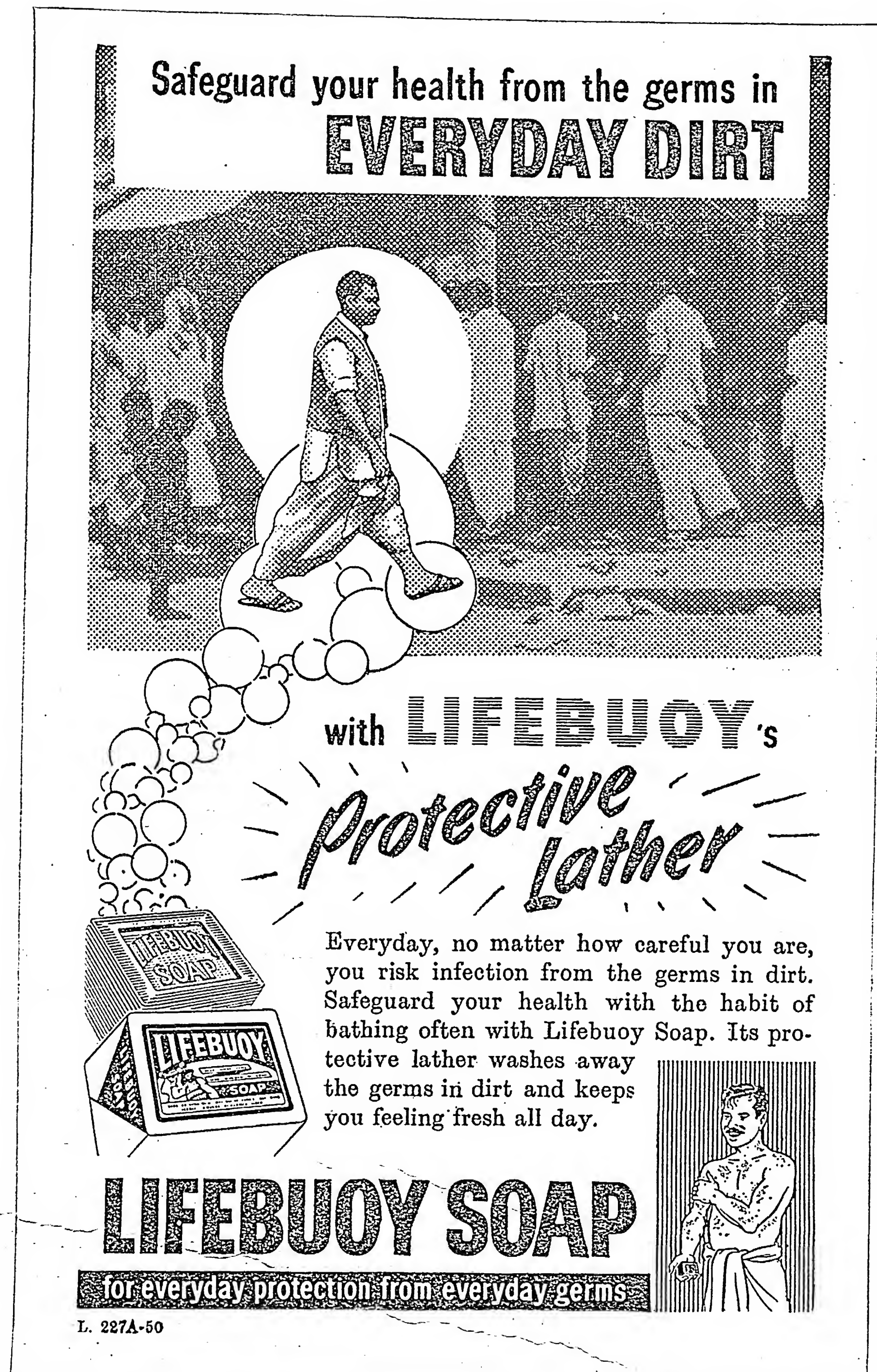
Before I left village Ashta and my genial host Kallappa, I put him a few personal questions. I asked him how he intended spending his prize money of Rs. 1,000.

He told me: "I have already spent Rs. 500 on providing the village temple with a marble floor.

(*Contd. on page 32*)

Shrimati Antubai is of constant help to her husband, Shri Kallappa Chougule, in field and home. Husband and wife discuss a farming problem




Safeguard your health from the germs in
EVERYDAY DIRT
with LIFEBUOY's
Protective Lather
Everyday, no matter how careful you are, you risk infection from the germs in dirt. Safeguard your health with the habit of bathing often with Lifebuoy Soap. Its protective lather washes away the germs in dirt and keeps you feeling fresh all day.
LIFEBUOY SOAP
LIFEBUOY SOAP
LIFEBUOY SOAP
for everyday protection from everyday germs
L. 227A-50

SEASONAL PESTS OF CROPS: SUGARCANE LEAF HOPP

By

E. S. NARAYANAN,

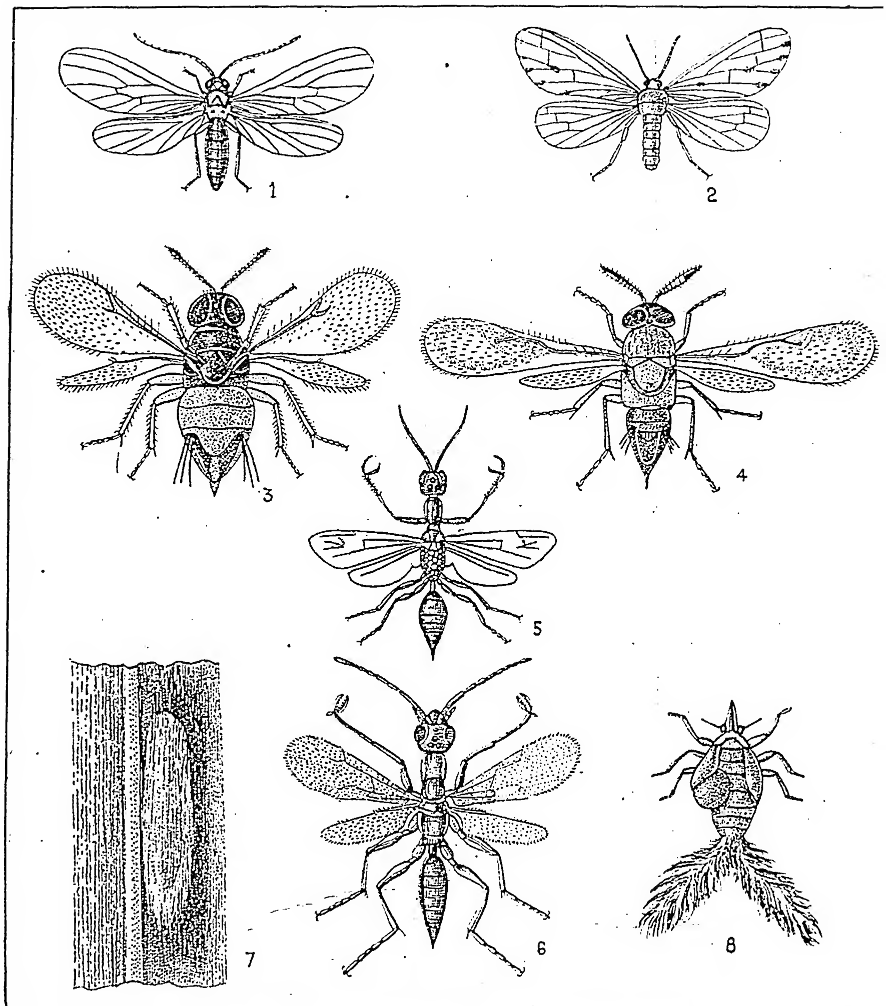
Head of the Division of Entomology, I.A.R.I., New Delhi

OF the many problems that confront India's sugarcane cultivators, the most serious undoubtedly is the problem of the insect pests of sugarcane. By causing serious damage to cane in diverse ways resulting in a significant decrease in the yield of crop, they deprive the hard working peasant of that extra income that means so much to him. The sugarcane borer problem was dealt with in an earlier article.* Next only in importance to the stem and top borers is the sugarcane leaf hopper, *Pyrilla perpusilla* which in certain years occurs as a serious epidemic in factory farms and cultivators' fields and is the cause of so much damage and almost ruin of the sugarcane crop. In the following pages the bionomics and control of this serious pest is described in some detail.

DESCRIPTION OF THE PEST

P. perpusilla is a soft-bodied sucking insect that drains the sap in the sugarcane leaves and so affects the recovery of sucrose, both in quality as well as in quantity. It also affects the yield of cane to a great extent. The *gur* that is produced from *Pyrilla*-infested canes is also poor in quality. The pest was first reported from North Arcot near Madras in 1900. During the last five decades it has infiltrated into all the sugarcane growing tracts of the Indian Union and has gained a notoriety second only to the borers. Of late there has been a good deal of confusion regarding the true specificity of the pest occurring in the different sugarcane growing regions of the Indian Union. Recent researches carried out at the Indian Agricultural Research Institute have shown that there is actually only one species of the pest namely *Pyrilla perpusilla* and that *Pyrilla*

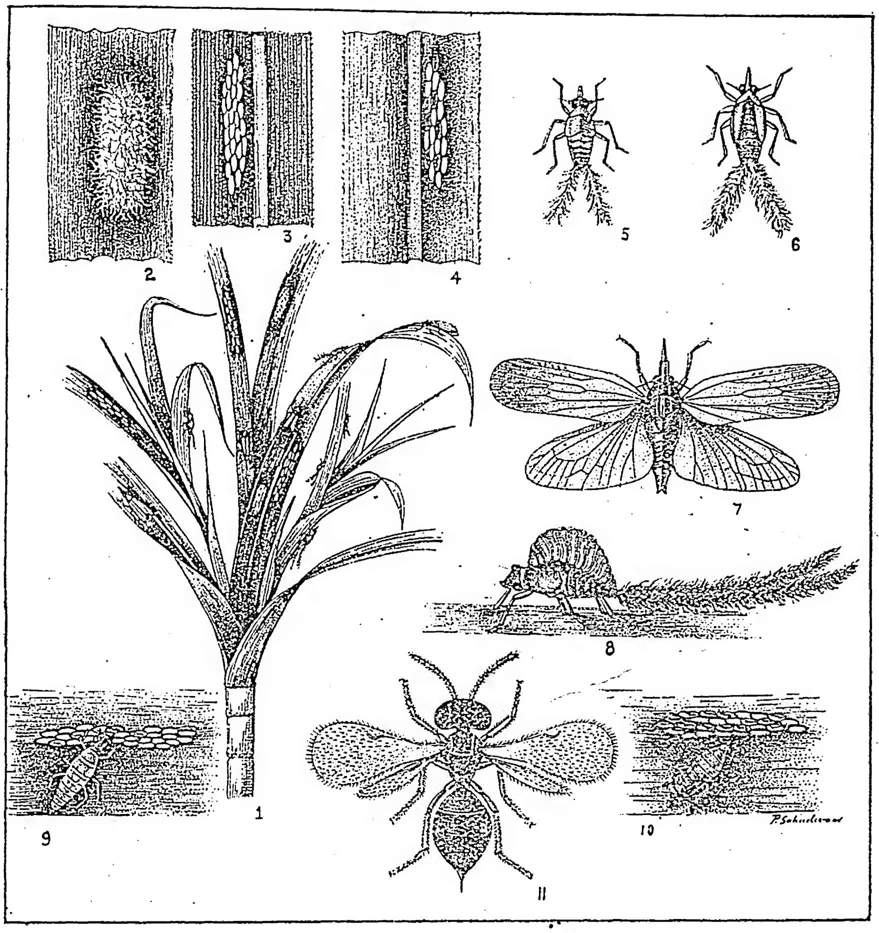
* "The root, stem and top borers of sugarcane and the methods of their control." Indian Farming, April, 1953.



SOME OTHER PARASITES AND PREDATORS OF 'PYRILLA PERPUSILLA' WLK.

1. Adult of 'Coniopteryx pusana' Withycombe, a predator on the eggs of 'Pyrilla'; it is a predator in the larval stage
2. Adult of 'Nimboa basipunctata' Withycombe, another predator on the eggs of 'Pyrilla'; it is also a predator in the larval stage
3. Adult female of 'Ageniaspis pyrillae' Mani, a chalcid parasite on the 'Pyrilla' eggs
4. Adult female of 'Cheiloneurus pyrillae' Mani, another chalcid parasite on the 'Pyrilla' eggs
5. Adult of 'Lestodryinus pyrillae' Kieffer, a Dryinid parasite on the 'Pyrilla' nymphs
6. Adult of 'Chlorodryinus pallidus' Perkins, another Dryinid parasite on the 'Pyrilla' nymphs
7. Pupa of 'Lestodryinus pyrillae' on a sugarcane leaf
8. Parasitized 'Pyrilla' nymph showing the development of the parasite, 'Lestodryinus pyrillae' inside the sac (thylacium)

ER *PYRILLA PERPUSILLA* WALKER



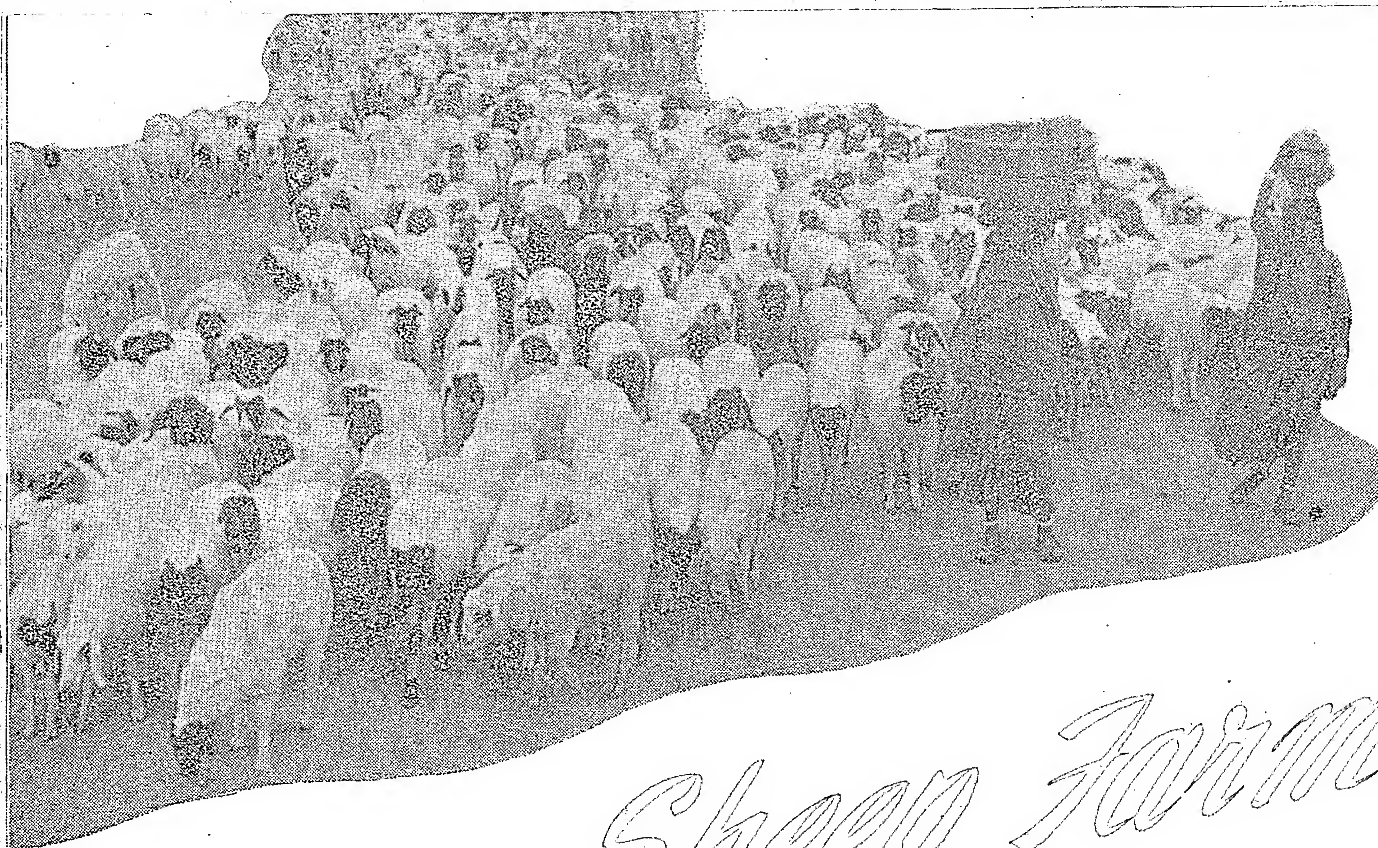
'PYRILLA PERPUSILLA' WLK. AND ITS PARASITES AND PREDATORS

1. Sugarcane plant showing the various stages of the pest
2. Freshly laid egg-mass
3. Egg-mass with the hairy covering removed
4. Egg-mass with some eggs parasitized
5. Young nymph
6. Full-grown nymph
7. Adult leaf-hopper
8. Parasitized nymph with the parasitic larva of 'Epipyrops melanoleuca' Fletcher on its body
9. Egg-mass of 'Pyrilla' showing the larva of 'Conioptery pusana' predating on the eggs
10. Egg-mass of 'Pyrilla' showing the larva of 'Nimboa basipunctata' predating on the eggs
11. Adult female of 'Tetrastichus pyrillae' crawf., a chalcid parasite on the eggs of 'Pyrilla'

aberrans and *Pyrilla pusana* are only varieties of this species. Outside India the pest has been recorded from Thailand, Burma and Ceylon. Though *Pyrilla* appears year after year in large numbers, its occurrence in an epidemic form is only cyclical. When it occurs as an epidemic, its spread is simply phenomenal and the damage caused catastrophic and destructive.

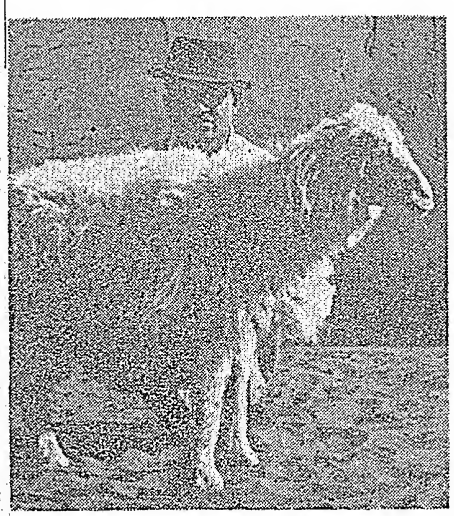
Pyrilla makes its first appearance in the field in the adult form about the end of March. There is little doubt that the climatic conditions that prevail in the field during the months of April and May will govern to a great extent the future activity of the pest. This is the time of the year when sometimes we get hail or thunderstorms followed by sharp and heavy showers. This sudden change in the climatic complex affects adversely the activity of the pest, its reproduction and growth and the distribution of its progeny in time and space. In such a weather as this, many adults perish and so the population of the pest is negligible during the succeeding months. Even the prevalence of high temperatures ranging between 108° to 110°F accompanied by hot northernly winds continuously for a number of days in summer, affects the activity of the pest very adversely. They perish in large numbers in the scorching heat and this early death in the beginning of the season affects the population of the pest in August and September, when their activity is greatest in the sugarcane fields. If, however, there are no such sudden changes in the climatic conditions described above and the weather is comparatively mild and uniform in April and May, followed by rain and the resultant humidity in July and August, the pest finds such a combination of weather conditions extremely conducive to its rapid growth and multiplication.

(*Continued on page 30*)



CARAVAN OF NOMADIC FARMERS ON THE MOVE

Sheep Farming

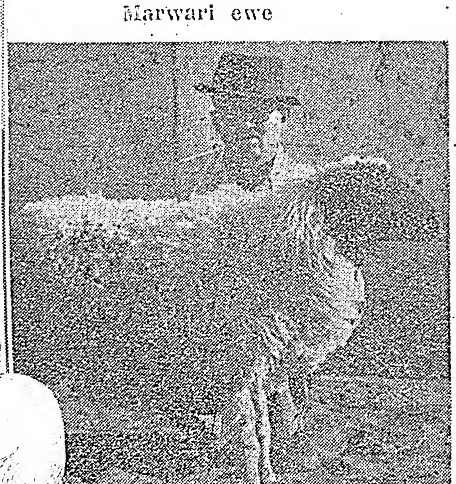


Magra ewe

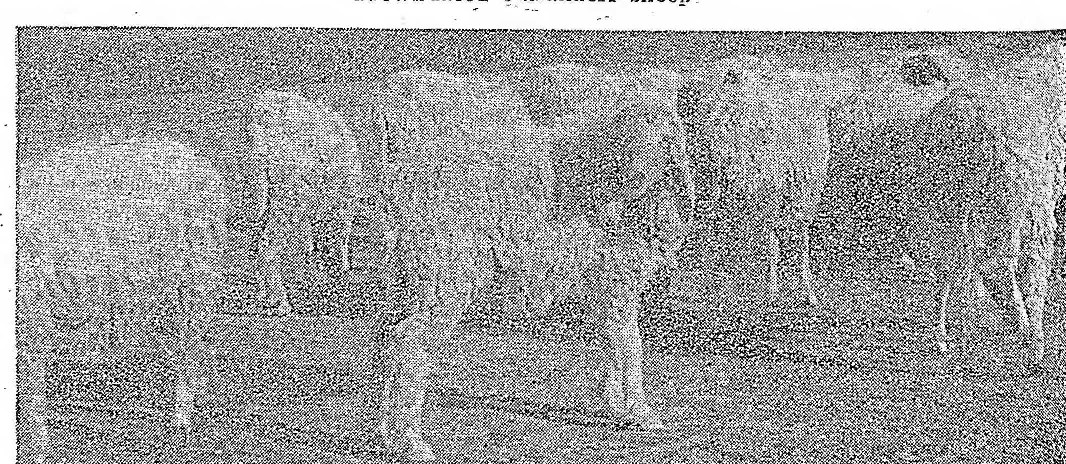
RAJASTHAN is an important wool growing State in India producing nearly one-third of the country's total yearly output. The 1951 livestock census has revealed a sheep population of $53\frac{1}{2}$ lakhs in the State. There has been a reduction in the population in the course of last six years by more than 18 lakhs; this is nearly 25 per cent of the population recorded in the 1945 census. This may be attributed to the effects of partition which might have caused permanent migration of stock, and loss of stock due to severe and successive droughts and outbreaks of contagious diseases.

The most thickly populated area in the State with density varying from 56 to 102 sheep per square mile is the central belt of land running from south-west to north-east, with an average rainfall of 15 to 23 inches. The area northern to this belt has a lower density varying from 17 to 29 sheep per square mile on account of lower rainfall of 5 to 10 inches and semi-desert conditions. The density varies from 14 to 47 sheep per square

Marwari ewe



Brown-faced Jaisalmeri sheep



in Rajasthan

mile in the districts southern to this belt on account of higher intensity of cultivation and rainfall varying from 30 to 50 inches.

Sheep population per hundred persons varying from 6 to 16, is the lowest in Kotah Division in the east and highest in Jodhpur Division in the west where it varies from 55 to 208. Sheep farming is the mainstay of a very large portion of the population in Jodhpur Division and parts of Bikaner and Jaipur Divisions. Directly and indirectly by way of wool cleaning, marketing and processing, sheep and wool industry is generally estimated to support about ten lakhs of people in the State.

SHEEP BREEDS

Eight breed types of sheep have so far been identified in the State. The question as to how many of these can be recognised as breeds is yet under study. However, mention of a few salient characteristics of each would not be out of place in this note as they have a direct bearing on sheep farming tendencies here.

Nali: These sheep are usually found round northern borders of Bikaner Division extending into the Punjab. They are light brown-faced with long ears, weighing on an average 67 lb. and producing about 3 to 6 lb. of washed wool of coarse quality per year. The wool clips of both the seasons in this area are stained yellow, whereas in other parts of Rajasthan, autumn clip is stained yellow, while the spring clip is white.

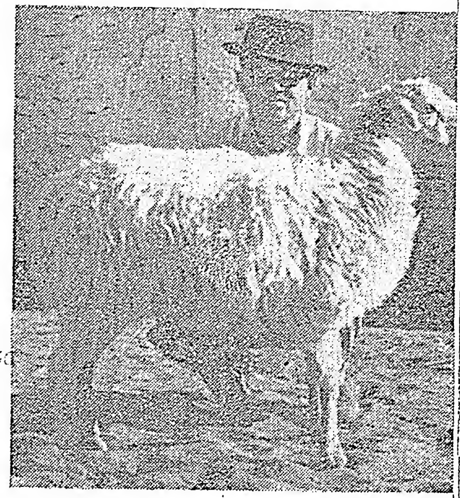
Magra: These sheep are distributed round the borders of Jaisalmer, Nagaur and Bikaner districts. They are of good build, with light brown patches around their eyes, and weigh on an average 83 lb. They are shorn three times in a year and produce about 3 to 4 lb. of washed wool of coarse quality per year.

Chokla or Shekhawati: These sheep are found in Churu, Jhunjhunu and Sikar districts. These are of very light build, weighing only about 52 lb. on an average, with dark brown and black patches on their faces. They produce 2 to 4 lb. of washed wool of fine and medium qualities per sheep per year.

Marwari: These sheep are found all over Jodhpur and parts of Jaipur Divisions. They are black-faced and of stocky and medium build weighing about 61 lb. on an average. They produce 2 to 4 lb. of washed wool of medium and coarse qualities per year. This is a highly stabilised breed type, capable of undertaking long travels and possessing high resistance to diseases and drought.

Jaisalmeri: These sheep are

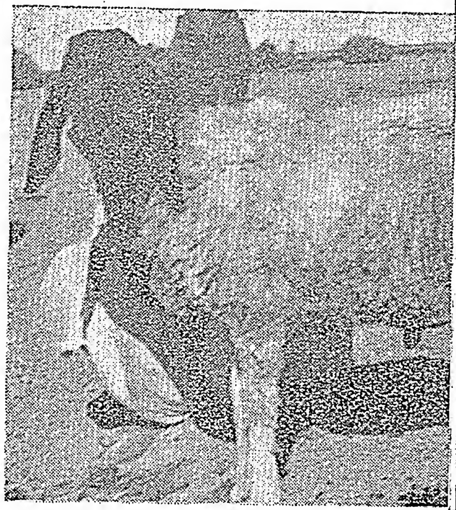
(*contd. on page 26*)



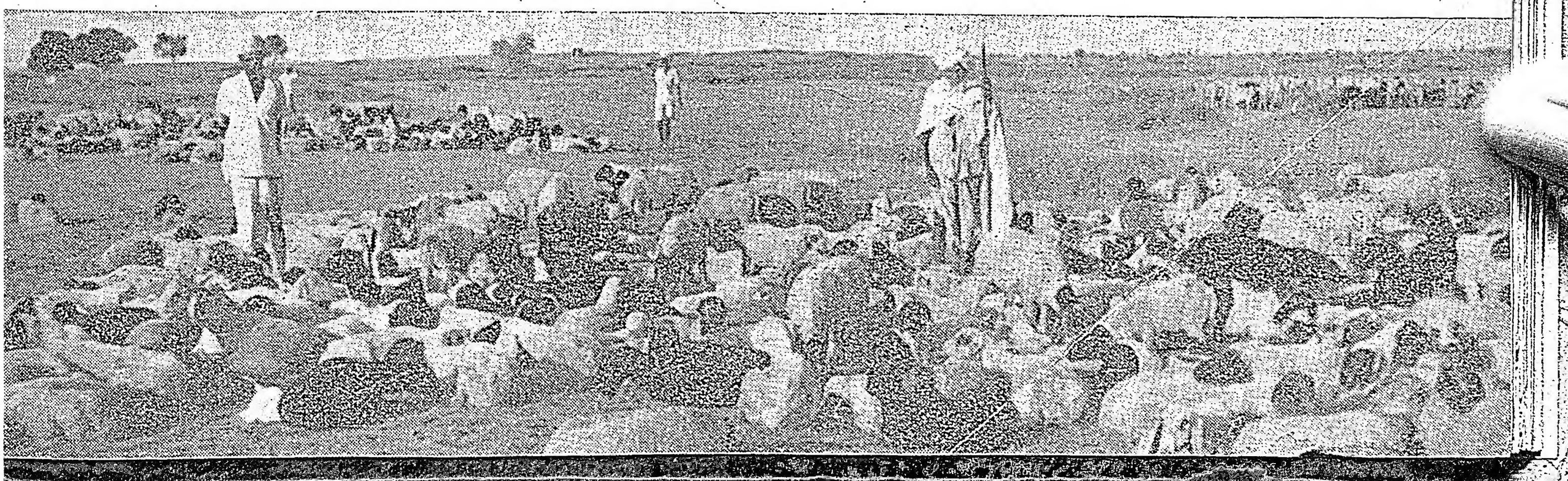
Malpura ewe

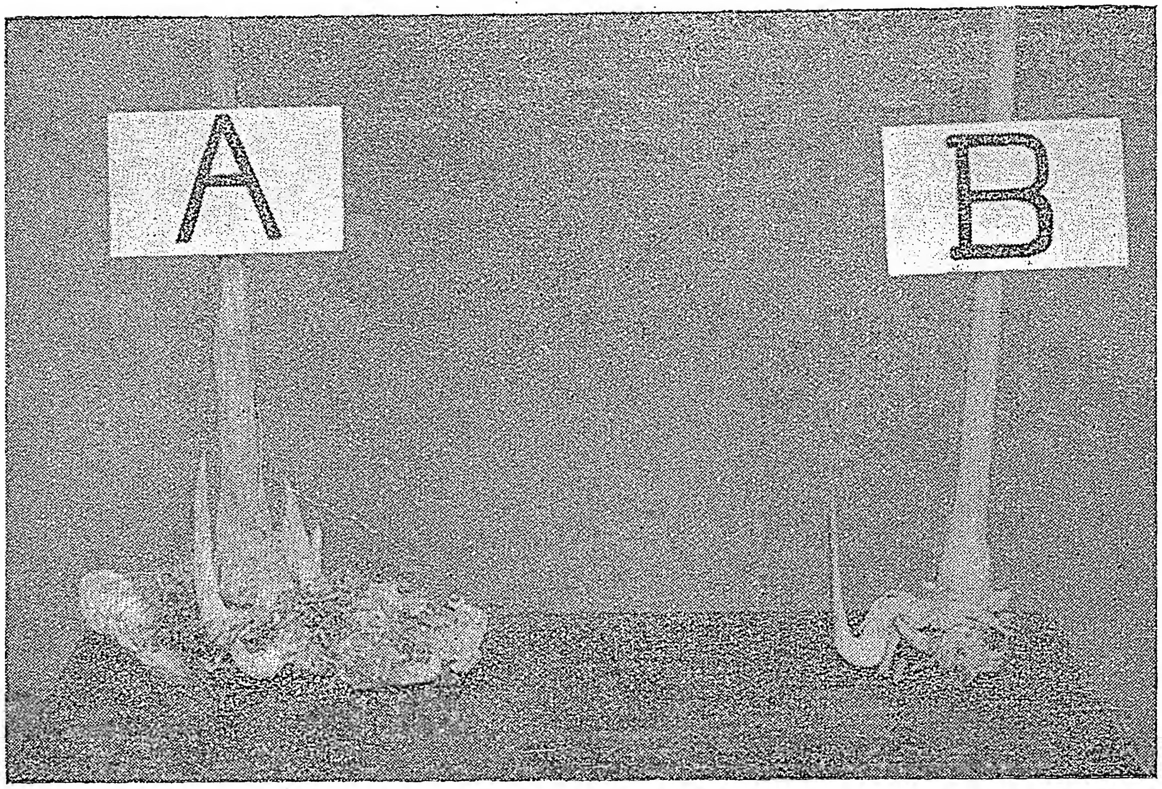
Black-faced Jaisalmeri ram

Note how genital organs are tied by thread to restrict it from breeding, and desert vegetation behind



Nomadic flocks resting in the fields





A = Mother rhizome — long (Note the large number of vegetative buds)
B = Mother rhizome — short

USING LONG RHIZOMES FOR CARDAMOM PLANTING

By V. GOMATHINAYAGAM PILLAI

CARDAMOMS (*Eletteria cardamomum* Maton) are propagated both by seeds and by rhizomes. If seeds are used for propagation, it takes five years for the crop to start yielding. If the vegetative propagation is resorted to, the 'maiden harvest' can be had in the third year after planting. This is the chief point in favour of the latter.

It has been observed that the planters do not generally use sufficiently long rhizomes for planting. One or more of the following three considerations on their part appear to be responsible for resorting to this 'false economy'—(a) cost of planting materials, (b) difficulties of transporting them through forest and (c) the limited supply.

To determine definitely the advantages, if any, in using long rhizomes for planting, an experiment, the first of its kind, was laid out in the Cardamom Research Station, Singampatti, in 1949.

The indigenous variety of Singampatti was used in the experiment. It comes under the group of 'Mysores'. The plants are tall (average 300 cm.) and robust. The leaves are glabrous, 37.7 cm. long and 8.2 cm. broad on an average. Each clump puts forth about 15 aerial shoots when fully developed. The panicles are erect and rather loosely packed. The capsules are about 2 cm. long and 1 cm. broad and contain 10 to 16 seeds each. It was not possible to include other erect and creeping panicled varieties of South India in the experiment as their rhizomes were not available at the Research Station when the experiment was started. As the estate in which the Research Station is located has a vast area of over 1,400 acres under cardamom free from mosaic disease, and as the disease is likely to be carried into the estate if rhizomes of other varieties are brought in from outside, no such import could be thought of.

There were two variants in the experiment, (a) mother rhizomes long (8 in.) and (b) short (1 in.). The unit plot in the experiment consisted of a row of five plants planted eight feet apart. The inter-space between the rows was also eight feet. The variants were randomised and replicated 12 times. The planting was done in July, 1949, after the south-west monsoon set in, in pits three feet long, three feet wide and one foot deep. The plants got themselves established well.

Vegetative buds began shooting up in October, 1949. They put forth their leaves in January, 1950. Shoots with at least two leaves were taken as one

aerial shoot for the purpose of the experiment. The counts of aerial shoots in each pit were recorded periodically once a fortnight from July, 1950, when the average number of aerial shoots was only 3.5 in variant (a) and 2.3 in (b) per clump. It was found that the average number of aerial shoots in variant (a) was always higher than that in (b). The data gathered were analyzed statistically. The difference was significant. The observations were continued upto February, 1953. The significant difference was maintained throughout. When the experiment was concluded in February, 1953, it was found that the number of aerial shoots per clump in variants (a) and (b) was 15.7 and 11.2 respectively. The variant (a) was always about six to seven months in advance of (b) in the process of development of clumps. Such an early development results in early production which in turn gives a net profit of Rs. 36-4-0 per acre as shown below. The difference in the cost of cultivation between the two methods adopted lies only in the difference in the cost of planting materials:

One cardamom clump consists of about 15 grown-up aerial shoots

The usual price of one clump sold for planting is Rs. 1-8-0

Number of 'splits' with long rhizomes that can be had from one clump—8

Number of 'splits' with short rhizomes that can be had from one clump—15

Therefore, the cost of one 'split' with long rhizome, Re. 0-3-0

The cost of one 'split' with short rhizome, Re. 0-1-7

The difference in price per 'split' Re. 0-1-5

The difference in the cost of transport per 'split' Re. 0-0-1

Total difference in the cost per 'split' Re. 0-1-6

Number of 'splits' required for planting an acre when eight feet spacing is adopted—680

The enhanced expenditure in using long rhizomes —680 x 0-1-6 = Rs. 63-12-0

When long rhizomes are used for planting, the plantation starts bearing about six months earlier

The annual average yield per acre, 50 lb.

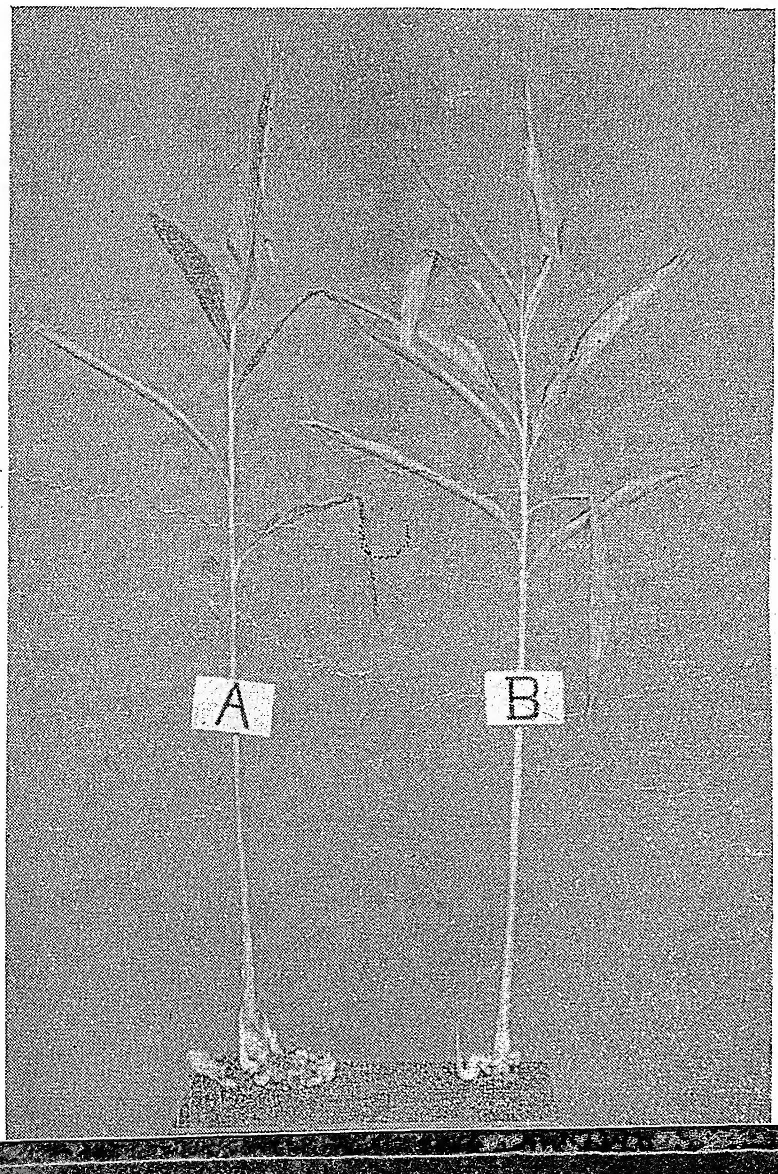
The increased yield in six months per acre, 25 lb.

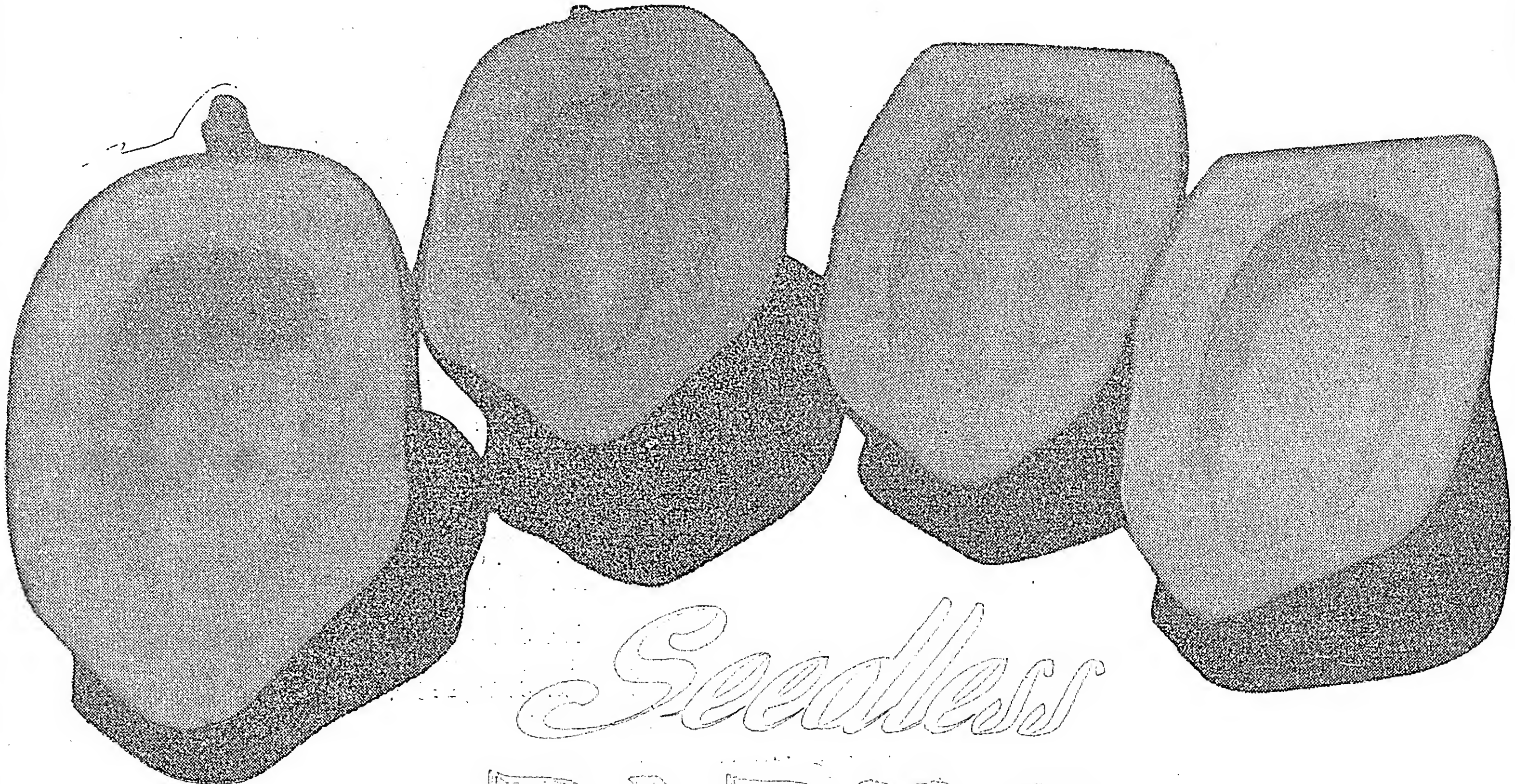
The value of 25 lb. of cardamom at Rs. four per lb. —the lowest price now prevailing, Rs. 100

Deduct extra cost per acre in planting long rhizomes, Rs. 63-12

Net profit in using long rhizomes per acre (Rs. 100 *minus* Rs. 63-12) = Rs. 36-4

A = Mother rhizome — long
B = Mother rhizome — short





Seedless fruits of Papaya obtained by bagging a female flower

Seedless PAPAYA

By B. L. CHOUDHARI

SEEDLESS guavas, papayas, custard-apple, etc. are highly appreciated and are in great demand. The nurseries take advantage of this and very often advertise such varieties. In case of papaya, however, it is a great hoax. There cannot be any true-to-type seedless variety of papaya. Anyone desirous of obtaining seedless papaya fruits can have them from any variety. To understand and follow the technique of obtaining such fruits a basic knowledge of flowering of papaya plant is necessary.

TYPES OF PAPAYA FLOWERS

Papaya is a polygamous plant having three main sex types—male, female and hermaphrodite, i.e. male and female in one. The male tree has male flowers on long pendulous stalks. It does not yield fruit.

At times hermaphrodite flowers in papaya are borne on long pendulous stalks; it is not very common

Male flowers with a few swollen rudimentary pistils

Bagging a female flower to get seedless fruit

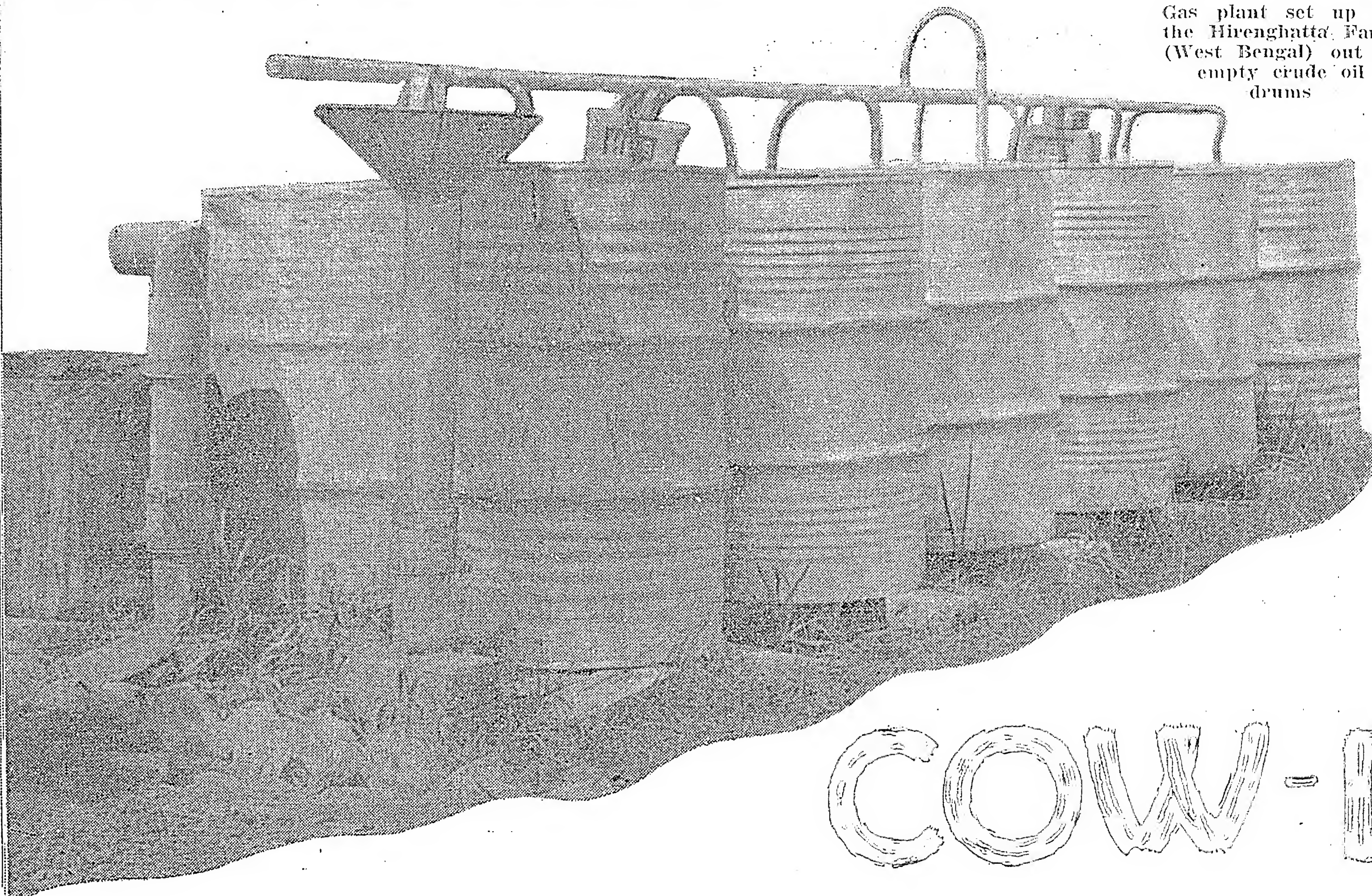
At times, however, small useless fruits appear and fall down long before maturity. These are swollen forms of rudimentary pistils of male flowers. The main function of the male tree is to provide anthers for the pollination of female plants. Female flowers are generally large, fleshy, petal ones borne in the axil of the leaf. These provide excellent fruits of regular shape. Hermaphrodite tree has complete flowers which are capable of self-pollination, whereas, pure female type of plant must get pollens from the male or hermaphrodite flower to get pollinated.

HOW TO GET SEEDLESS PAPAYA

The female flowers, as has been stated above, are dependent on male or hermaphrodite flowers for fertilization. If they are unable to get the pollens, they fail to get fertilization, but their ovaries continue to grow thereby resulting in seedless fruits.

To get seedless papaya, therefore, all possibilities of pollen reaching the stigma of the female flower should be stopped. This is done by enclosing the female flower in a parchment paper envelope long before it opens. The envelope is retained on the flower till its petals are dropped and the ovary starts swelling. This will result in a seedless fruit.

Such a fruit generally does not grow to full size. It is lighter in weight and watery in taste. Except as a novelty there is not much in its favour.



Gas plant set up on the Hirenghatta Farm (West Bengal) out of empty crude oil drums

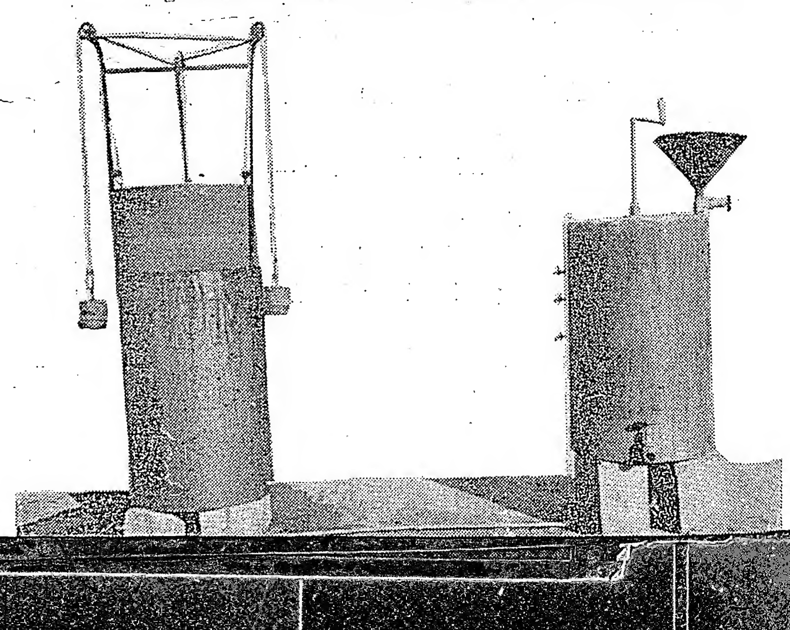
COW-D

C. N. ACHARYA, I. A. R. I., New Delhi

IT is well known that a considerable proportion of the cattle-dung produced in the country is burnt up as fuel, thus depriving our lands of valuable manure. This is primarily due to a shortage of fuel resources in the country, caused by widespread deforestation and indiscriminate cutting down of village trees, without a planned effort to replace them by planting fresh saplings. Attempts have recently been made to partially make good the loss of cattle-dung so burnt, by introducing the system of compost-making, whereby a small quantity of cattle-dung could serve as a starter for converting a larger bulk of litter, leaves, weeds and waste straw into useful manure. An alternative system that has been suggested is to obviate the need for burning of cattle-dung by obtaining combustible gas from it by the process of anaerobic fermentation, and to use the gas so produced as fuel for household cooking and heating purposes. At the same time, the residual matter (called the digested slurry) left over after the anaerobic fermentation of the dung, could be used as manure. Thus, the farmer can by this method obtain

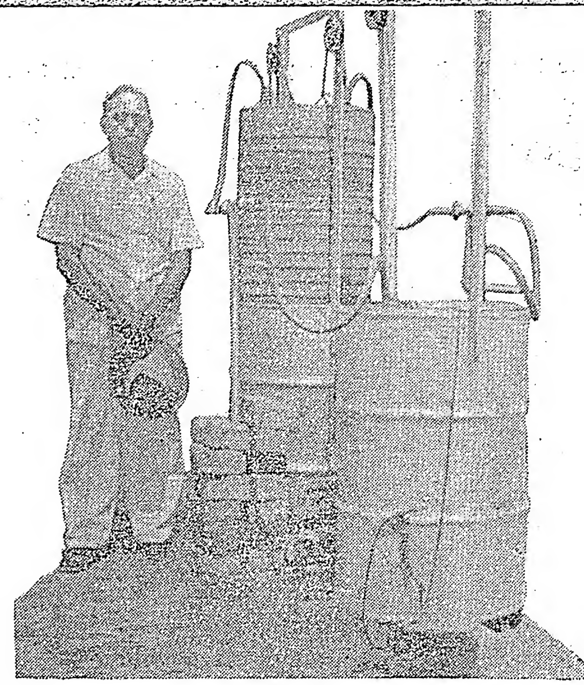
A simple model of gas plant set up at the Shilpamandira, Sri Ramakrishna Math, Belur

Pilot Gas plant set up at the Agricultural Research Institute, New Delhi, in 1944



from his cattle-dung both fuel for his household needs and manure for his farm requirements; and the proposition appears to be an attractive one, if the process could be made to operate in an economical and efficient manner.

Since the process is one of bacterial fermentation, it has to be controlled in a scientific manner and made to yield the maximum quantity of combustible gas. Further, a model or a number of different models of the gas plant must be devised which could suit the needs of different types of customers, e.g. a small scale farmer with limited resources, maintaining three or four head of cattle only, or a bigger farmer owning 20 to 30 head of cattle or a dairy with ample resources, possessing hundreds of animals. Sometimes, it may be possible for a co-operative organization or a village *panchayat* to set up gas production on a combined basis for the whole village, utilizing the whole of the cattle-dung produced in the village. The method can also be extended to municipalities who can utilize, for the purpose of fermentation and gas production, other refuse materials collected by the municipality, e.g. night-soil and garbage. Evidently, the model of plant needed in any particular case will depend on the nature and quantity of refuse materials that are available for gas production and also to a certain extent on the capital resources of the customer.



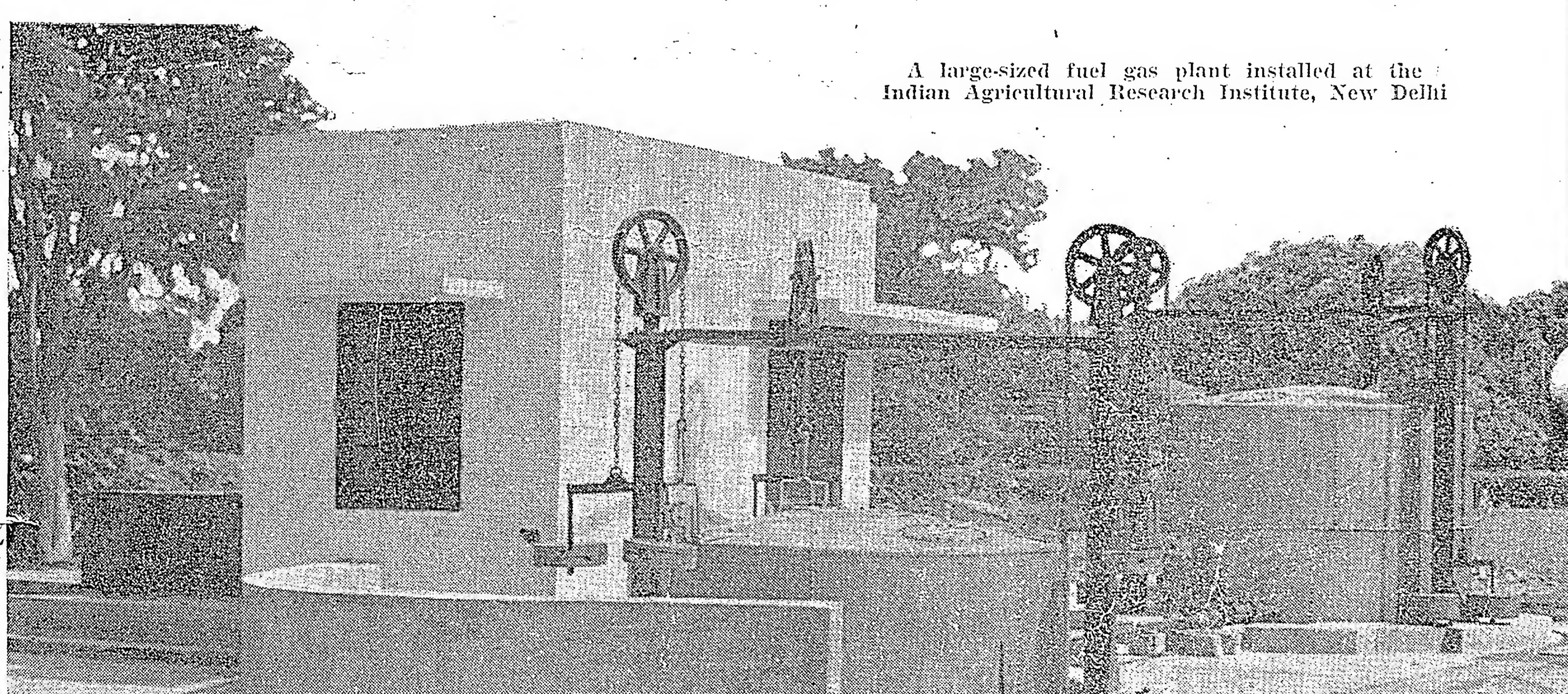
Gas-holders installed at the Hirenghatta Farm

UNG GAS PLANTS

WORK AT THE I.A.R.I.

Experimental work in the production of combustible gas from cow-dung was first started at the Indian Agricultural Research Institute, New Delhi, in 1939 on a small scale, using bottles only. A pilot plant was later devised by Dr. S. V. Desai and was set up at the Institute in 1941. It is satisfactory to note that this plant has been working smoothly for

A large-sized fuel gas plant installed at the Indian Agricultural Research Institute, New Delhi



the last 12 years. The plant was designed to carry a charge of 10 lb. of cow-dung per day.*

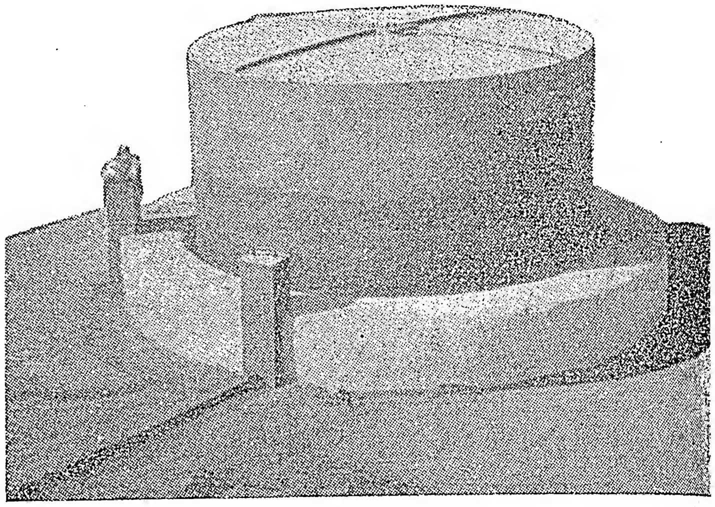
The rate of gas production was found to vary greatly with the season and atmospheric temperature; it rose up to about 1 cu. ft. of gas per lb. of cow-dung added, during the summer, and went down to about one-third the above level during the winter. The gas contained on the average about 45 to 50 per cent methane, 40 to 45 per cent carbon dioxide and about 10 per cent hydrogen. The heating value was found to be superior to the town-gas supplied in Bombay and Calcutta, the thermal value being about 550 to 600 B.T.U. per cu.ft. of gas, as compared to about 450 B.T.U. per cu.ft. of coal or oil gas. The cow-dung gas can be fed to burners and used for heating or cooking purposes; or it could be fed to gas lamps provided with mantles and used for lighting purposes. An average family of four to five members would require about 60 cu.ft. of gas per day for cooking purposes. The lighting requirements may be estimated from the fact that a mantle of 50 candle-power capacity would require about 2½ to 3 cu. ft. of gas per hour.

Desai and Biswas also found that there was no loss of nitrogen during the fermentation process, and that the digested slurry could be dried in the sun and used as manure. The manure so obtained contained up to 1.7 per cent nitrogen and crop experiments showed that it was superior to farmyard manure in its effect on crop yield. The whole process was hygienic and the digested slurry had no bad smell and did not attract flies, in sharp contrast to fresh cow-dung which promoted profuse fly-breeding.

OTHER EFFORTS

The work carried out at the Indian Agricultural Research Institute, New Delhi, on gas production from cow-dung attracted considerable attention at other centres and Prof. N. V. Joshi, an ex-Officer of the Institute, started experiments at Poona and devised a model of gas plant for which he obtained a patent in 1947.† A small demonstration plant was set up at the Law College, Poona, and a large-size plant was installed on the sugarcane estate of the Walchandnagar Industries, at a cost of about Rs. 18,000 for dealing with about 4,000 to 5,000 lb. of cow-dung per day.‡ The design of the plant was similar to that of Dr. Desai at the Indian Agricultural Research Institute, except that the cow-dung slurry was admitted at the bottom of the fermentation tank instead of at the top.

A more important development was the work of Shri Jashbhai Patel,§ a graduate of the Poona Agricultural College, who carried out considerable experimentation on the subject and designed in 1951 a simple type of equipment called the Gram-Laxmi Gas Plant, which required less capital expenditure than Dr. Desai's or Prof. Joshi's models.



The first Gram-Laxmi Gas Plant set up in Bombay in January, 1951

The average Indian farmer is reluctant to take to new appliances and methods which involve heavy expenditure. In order to make a special appeal to such individuals, it is necessary to make a beginning with very small and simple plants which do not involve much expenditure. An attempt in this direction has been made by Shri Satish Chandra Das Gupta of the Khadi Pratisthan, P.O. Sodepur, 24 Parganas, West Bengal, who has devised a very simple model of 'Gassok' Gas plant, made out of bamboo-thatch cylinders sunk into the ground to form cow-dung digestion tanks. He is also trying to utilize similar bamboo-thatch plastered with earth and cement, to prepare cheap types of gas-holders to contain the combustible gas. By these arrangements, he hopes to be able to supply to the Indian farmer cow-dung gas plants at a cost less than Rs. 100 per unit which could produce about 50-60 cu. ft. of combustible gas per day—sufficient to meet the fuel needs of a family of four or five members.

The degree of interest which the cow-dung gas plants have aroused in the country can be gauged from the fact that a socio-religious organization like the Sri Ramakrishna Mission at Belur have joined the movement and have set up simple models of the plant in their Shilpa Mandira at Belur Math.

The West Bengal Government Farm at Haringhatta have also set up a simple model of the plant, made out of empty crude-oil drums (40 to 50 gallons capacity) which are connected in series, so that the

(Contd. on page 28)

* A full description of the plant and the details of operation and the results obtained have been given in an article which appeared in the February 1945 issue of *Indian Farming* and also in the "Developing Village India", Special Number of *Indian Farming*, July, 1946.

† Prof. Joshi's models were being manufactured by Messrs A. B. Joshi & Co., 33/26, Erandavon, Poona 4.

‡ Prof. Joshi's work at Poona aroused considerable interest in the subject at that centre. The scientific aspects of the process were examined in some detail at the Agricultural Research Institute, Poona, and the results are embodied in an interesting paper by Shri B. P. Desai, which appeared in the August 1951 number of the Poona Agricultural College Magazine.

§ Shri Patel has given a description of his plant in an article in the Poona Agricultural College Magazine, Vol. 42, No. 3, 1951. The manufacture and marketing of the Gram-Laxmi Gas Plant is being done by Messrs J. P. & Co., Chapel Lane, Santa Cruz West, Bombay 23. This enterprising firm has carried out considerable propaganda for their plant and has set up a number of installations both in Bombay and at other centres. Recently, they have further improved their model by introducing multi-stage digestion partitions in their tank, whereby they claim that the dung is more fully digested and gas production is proportionately increased.

A NEW ECONOMIC 'JOWAR'

By
B. W. X. PONNAIYA and L. ANAVARADHAM,
Agricultural Research Station, Kovilpatti

'Periamanjal Irungu' crop under irrigated conditions in a private farm.

THE districts of Madurai, Ramanathapuram and Tirunelveli lie on the southernmost portion of the Madras State. In them a distinct, a semi-wild variety of *jowar* (sorghum) known as *Irungu cholam* is grown.

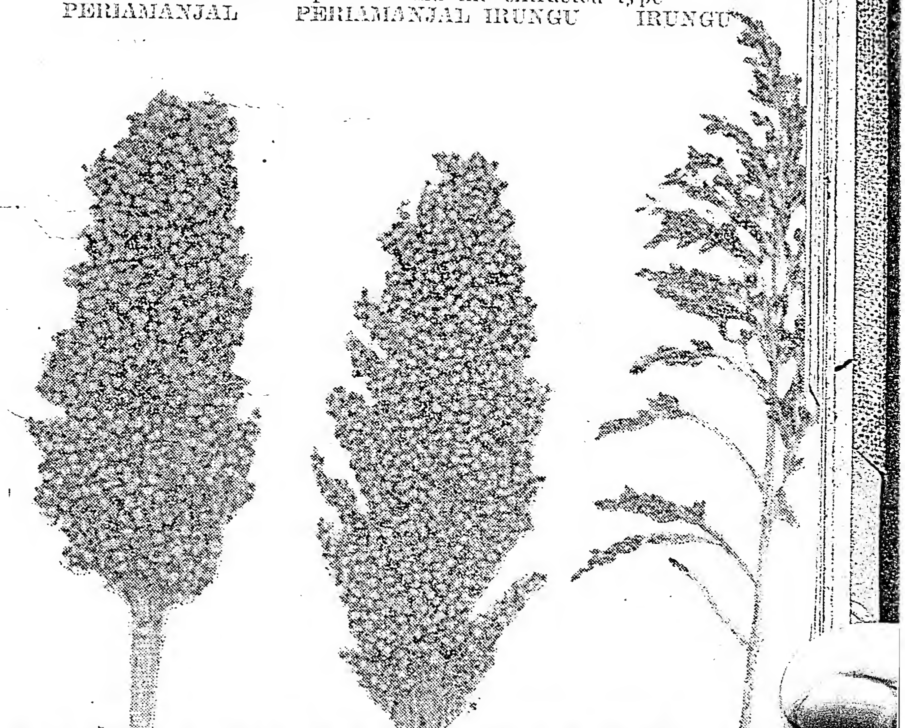
This has been classified under *Sorghum dochna* by Snowden, who has placed it between the grain and wild sorghums. It has been under cultivation for over a thousand years in this tract. The grains are small and, unlike the grain sorghum, are completely enclosed by glumes. As a grain crop, it has been confined to certain centres of the Madurai tract where types with white grains are sown. The enclosed grain does not get discoloured with the rains received during the flowering and ripening periods. In addition this variety has been found to be less susceptible to the bird attack as compared to those with exposed grains. In the Ramanathapuram and Tirunelveli districts this variety has brown grains and is being grown exclusively for fodder. A very heavy seed-rate upto 100 lb. per acre is used to secure a fine quality of straw which is barely three feet tall. The yield of dry straw is about 4,000 lb. per acre. The seed production is very low, about 200 lb., which is usually sufficient to sow the succeeding year's crop. As the grain is brown in colour and is bitter to taste it is not used as human food. The normal area of this crop is 1.92 lakhs of acres in the Madurai tract (grain crop) and 1.75 lakhs of acres in the Ramanathapuram and Tirunelveli districts (fodder crop).

The Madras Agricultural Department has been trying from 1911 onwards to replace this inferior type with suitable grain types but did not meet with success. The next attempt was to hybridize this variety, with the most economic grain sorghum (*jowar*) of the Madras State, the *Periamanjal cholam* (*Sorghum Dura*). A cross was effected in 1937 by the senior author and a pure line selection A.S. 7081 which has been named as *Periamanjal irungu* was evolved at the Millets Breeding Station, Coimbatore.

This new variety has been tested in the *Irungu cholam* tract and has been found to be similar to *Irungu* in duration having 120 days as against 135 days of the *Periamanjal cholam*. But the grain is bolder than that of *Irungu* and is yellow in colour which are the characters inherited from the *Periamanjal* parent. The grain is fit for human consumption.

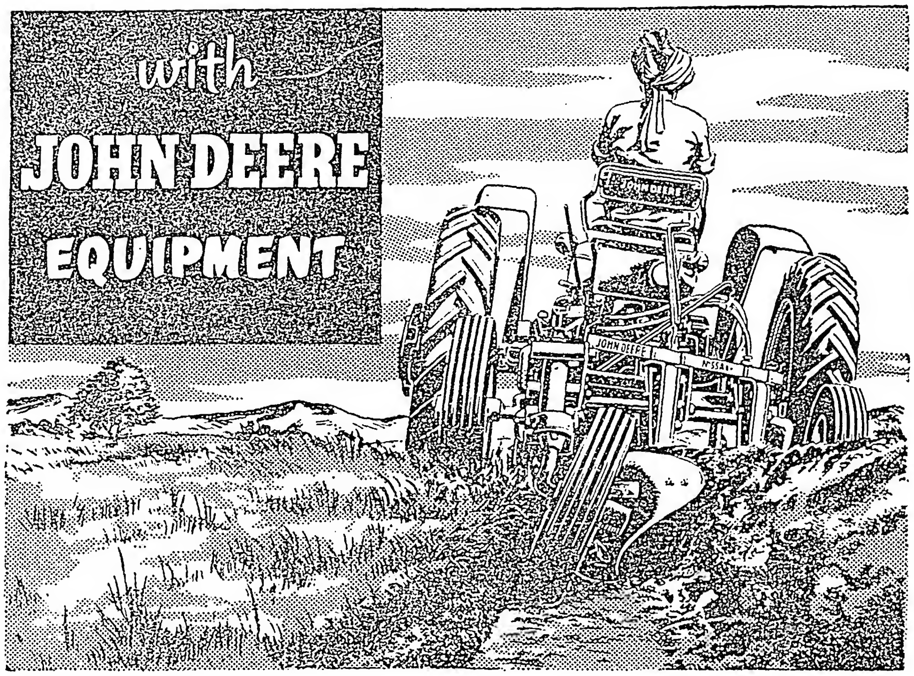
(*Contd. on page 32*)

Ear-heads of parents and the extracted type
PERIAMANJAL PERIAMANJAL IRUNGU IRUNGU



GET THE BEST

in Plow Performance



You get better work at lower cost with a JOHN DEERE Truss Frame Plow.

Here are tractors and plows in a class all by themselves when it comes to *modern* design—plows with entirely new and exclusive features, pioneered and developed by John Deere to handle every type of soil with greater efficiency . . . tractors and plows that will make *your* farming operation much easier, more profitable, more enjoyable.

JOHN DEERE QUALITY FARM EQUIPMENT

JOHN DEERE *TRACTORS & PLOWS*

Represented in India by

CALCUTTA	BOMBAY 1	NEW DELHI
TRACTORS (INDIA) LIMITED	**LARSEN & TOUBRO LIMITED**	**WILLCOX (BUCKWELL-INDIA) LIMITED**
P. O. BOX 323	P. O. BOX 278	P. O. BOX 289

AFTER SALES SERVICE :—3 free service visits in first six months of JOHN DEERE ownership. Also large stock of spares available at reasonable prices.

Rust-Resistant Wheat Varieties for Saurashtra

By

V. T. MOTWANI

A CULTIVATOR is disappointed when he finds that rust has started attacking his wheat crop, for he knows that his crop yield is certainly going to be reduced by 30-70 per cent. There are occasions when the yield of the rust-affected crop does not enable him to recover even the harvesting costs.

The wheat area in Saurashtra amounts to 1,94,400 acres (both irrigated and dry). A considerable portion of this area is under the variety known as *Lal katha,* i.e. local red. Some portion is also devoted to another local variety known as *Popatia* which is a husk-type with a yellowish grain. *Popatia* is resistant to rust. But, it is a low yielder and as the grains are to be husked, it fetches low price in the market. *Lal katha,* because of good tillering habit and eventual high yield, is very popular with the cultivators. But this variety is most susceptible to rust. The Botany Division at the Indian Agricultural Research Institute, New Delhi, has recently evolved some types popularly known as the N.P. wheats of the '700-series' which do escape rust.

To solve the rust problem by finding a suitable rust-resistant variety for Saurashtra, a trial was conducted in different parts of Saurashtra for three consecutive years, i.e. from 1950 to 1953. The trial included 12 N.P. types and two controls including N.P. 165 (an older N.P. wheat) which is also being grown in the State on a very small scale by some enthusiastic cultivators.

The first two years were practically rust-free years. But there was severe attack of the rust in the third year. The performance of some of the N.P. types was not encouraging in the first year, hence they were replaced by the other suitable N.P. types in the trials of last two years.

The trial in the first year was conducted at five places, viz. Junagadh, Porbandar, Morvi, Aliabada and Palitana. The results indicated that varieties N.P. 710, N.P. 715, N.P. 718 and N.P. 760 were at some places as good yielders as the local red, and at other places even high yielders than the local red.

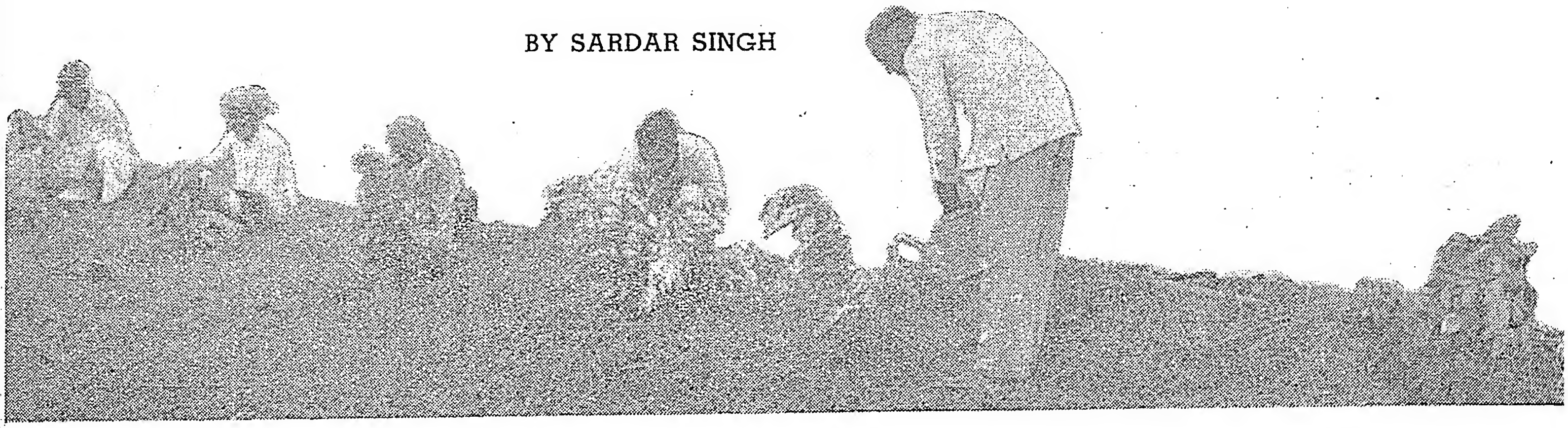
During the second year of the trial, Palitana was dropped. The performance of varieties N.P. 710, N.P. 715, N.P. 718, N.P. 720, N.P. 721, N.P. 760 and N.P. 782, as compared with the local red and even N.P. 165, was indeed very encouraging.

The same places except Morvi were chosen for the third year's trial. Due to the attack of rust, the yield of the local red was reduced by 66.6 per cent. There were some N.P. types, viz. N.P. 720 and N.P. 781 which were also affected by rust at all the

(*Contd. on page 32*)

SOME ACTIVITIES OF THE INSTITUTE OF PLANT INDUSTRY, INDORE

BY SARDAR SINGH



THE main problem confronting both the scientists and the peasants is, how best to raise the humus and the nutrient status of the soil. In this respect, plant leaves, particularly of leguminous plants, subscribe a great deal to ameliorate the soils. For this purpose, a perennial legume, *Glyricidia maculata,* has been introduced at the Institute. It thrives well on poor and waste lands where other crops do not grow well, and supplies green leaves containing twice as much nitrogen (1.11 per cent) as sann-hemp (0.5 per cent), a very common green manuring legume. It can thus spare the fields which can be sown with other crops.

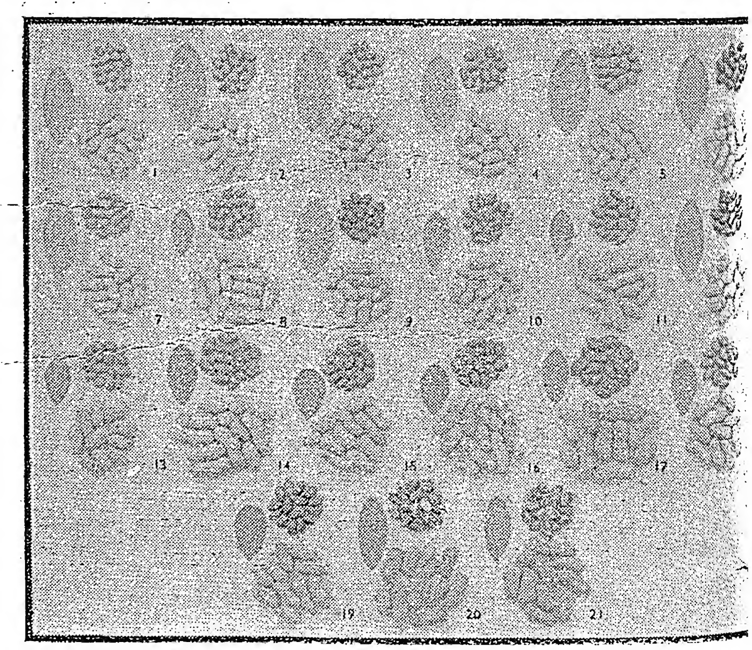
VEGETATIVE PROPAGATION OF COTTON

About 90 cotton plants with the scions of Karnak, an Egyptian cotton, have been grafted on the stock of three different *desi* cottons, namely, Bhoj, Jarila and Malvi 9 with a view to exploring the possibility of acclimatizing the fine Egyptian cotton strains either as annuals or perennials. The grafting was done during May and the plants were transplanted during July. It is interesting to mention here that these plants do not exhibit any sign of Jassid attack which has been found very severe on Egyptian cottons, if they are raised from their seeds.

NEW VARIETIES OF GROUNDNUT FOR MALWA

A large number of groundnut varieties both indigenous and exotic are under trial for the last six years. From amongst the indigenous varieties, TMV-4, a Madras type, has been found to be a better yielder than the commonly grown AK 12-24. On an average it has yielded 30 per cent more than the latter. Amongst the exotics obtained from Argentina, South Africa, Uruguay and Bolivia, the varieties from the first two places, i.e., Argentina and South Africa, gave 15 to 40 per cent higher yields even over TMV-4.

An interesting correlation is found to exist between yield and the morphological characters. The high yielders are very early (95 to 100 days) and have higher shelling percentage (78 to 82). These types have also small pods, seeds and light green foliage with large-sized leaflets. The lower yielders, on the other hand, have been found to be late in maturity (100 to 140 days) with low shelling percentage (66 to 74), bigger pods and seeds and dark green small-sized leaflets. Further trials are in progress to adjudge the best type and so far No. 6608 from Argentina appears to be the best type for this tract.



Twenty-one types of ground nut showing the seeds, pods and leaflets

1 to 6 — High yielders
7 to 12 — Average yielders
13 to 18 — Low yielders
19 to 21 — Very low yielders
Type 15 — AK 12-24
Type 8 — TMV-4
Type 1 — Strain 6608 from Argentina
1, 3, 4, 6, 12, 20, 21 — Exotics
2, 5, 8, 13, 16, 18, 19 — Madras types
15, 17 — Madhya Pradesh types
7, 10 — Bombay types
9, 14 — Madhya Bharat types

A REFERENCE TO TRANSPLANTATION OF PADDY (KALAMA) IN KALIDASA'S RAGHUVAMSA

THE reader of Kalidasa is struck by the prosperous condition of the country which is most lavishly attested to by innumerable allusions to luxuriant nature of its soil, in the various descriptions of scenes and sites and spontaneous profusion of simile in his works. In the 4th Canto of Raghuvamsa, Kalidas describes how prince Raghu, after receiving the charge of the kingdom handed over to him by his father, Maharaja Dilipa, marched on an expedition of conquest with the intention of bringing the various quarters under subjection. In verses 36 and 37 of this canto, he states that Raghu vanquished the Vanga (Bengal) chiefs (Vangan-utkhaya tarasas... IV, 36) and then re-established them in their own principalities. In this context Kalidasa gets an occasion to similize Raghu's action by a comparison with the process of transplantation of the paddy (Kalama) plants. The poet says:

A-pada-padma-pranatah kalama iva te ragum,
Phalaih samvardhayamasur-utkhata-pratiropitah.

—Raghu. IV. 37

Translation—As the kalama plants, after they are uprooted and then transplanted, yield a rich harvest bending low to their roots (or the lotuses at their roots) (by the weight of their grains), so those Bengal chieftains being first dethroned and then re-instated bending down to his very lotus-feet brought forward immense treasures to Raghu.

In this verse the expression '*Utkhata-pratiropitah*' signifies (1) (paddy plants) first uprooted and then transplanted; (2) (Bengal chiefs) first removed and brought under subjection and then re-established. The expression '*A-pada-padma-pranatah*' is also significant: it means (1) (paddy plants) bending down to the roots by the weight of their grains; (2) (Bengal chiefs) bending down to the King's lotus-feet. And the result of these two actions is also brought out by the poet in the expression '*Phalaih samvardhayamasur*' which signifies (1) (paddy plants after undergoing the transplanting process) yield plenty of grains; (2) (The chiefs who were first dethroned and then replaced) brought forward immense wealth to Raghu in the shape of presents.

This verse clearly shows that Kalidasa (who possibly lived in the 5th century) knew that Kalama

(*Contd. on page 25*)

Agricultural work in Jammu & Kashmir

By JIA LAL RAINA

ONE of the main side-occupations of the farmer in Kashmir, is fruit growing. He cultivates apples, pears, cherry, plum, peach, almond and walnut in his unirrigated lands. These fruit trees are subject to the attacks of Sanjosé scale.

Sanjosé scale insect has a number of host plants, and as such it is extensively spread over the valley and its final extermination is out of question. It is for this reason that annual sprayings are very essential to save the fruit trees. The work is of immense magnitude. A million and half fruit trees, which are highly susceptible, require to be sprayed annually. The spraying season is very short. It extends from early December to the end of March. The days of rain, snow and frost are to be excluded, as spraying cannot be conducted appropriately and profitably in such weathers.

So far this spraying was conducted with the help of a number of small hand-pumps and only 30 per cent of the number of fruit plants, requiring spraying, could be attended to annually. The yields of the unsprayed trees were also brought to the market. These fruits were speckled with red and dusky marks, and were of poor market value. It was, therefore, decided to use small power sprayers, that could be easily shifted from place to place in the valley. Experimental sprayings with these new machines gave quick and effective results and the total expenditure was also cut down by 30 per cent. The tall trees that were being partially sprayed received a thorough spray.

Mechanical spraying being a labour-saving device can be managed with a smaller staff both technical and non-technical.

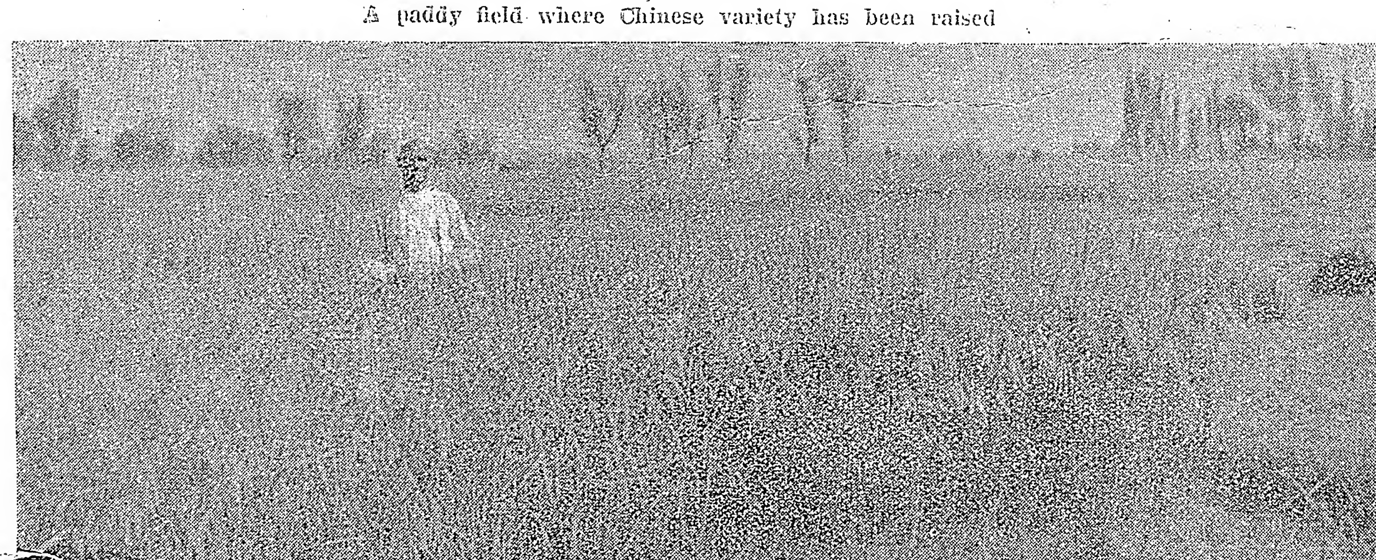
Spraying tree
With power sprayer

PADDY CULTIVATION

A little less than half a million acres of land are at present under the paddy crop. More than two hundred varieties are being cultivated, but most of these have a low yield. To obtain a greater outturn, a scheme was launched at the Khudwani farm, about 34 miles towards the south of Srinagar, where a number of experiments were conducted with the local and exotic types of paddy. The Chinese types were found to be the highest yielders. However, when tried on a large scale, these high-yielders were found defective in the respect that there was certain percentage of shedding.

Their behaviour was continued to be studied and greater attention was devoted to their shedding aspect. In these observations, China 1039 was found free from this defect. It is a pigmented variety and at the same time resistant to

A paddy field where Chinese variety has been raised



diseases. These experiments were conducted at various places including Government farms, illustration centres, privately-owned lands, etc. This variety seems to have appealed to the farmers who are now inclined to cultivate it in larger areas. So far it has given a maximum yield of 6,150 lb. per acre under ordinary conditions, and being a short-duration paddy, the yield is very high when compared to that from other short-duration types introduced in Kashmir.

Other exotic short-duration types were under trial this paddy season. Some of them which have so far given good results are U.S.A. 729 and Russian 3073, 1331 and 566. These types were tried at high altitudes and were found to mature even at 7,300 feet. This is quite new to Kashmir as paddy cultivation beyond 6,300 feet was hitherto unknown here.

Kashmir valley being occasionally subject to floods, requires the introduction of some types of paddy, which can stand the floods, and a high water level. In this direction, flood-resistant strain F.R.13 A, and deep-water paddy Amon II-Nos. 549, 502, and 609 were imported from India and put to trial. The results so far achieved appear to be hopeful.

AGRICULTURAL DEMONSTRATIONS

In collaboration with the Mulberry Department, the Department of Agriculture arranged about a dozen village shows attended by about half a million people. In these shows the working of agricultural tools and plant protection machinery including power sprayers and flame-throwers was demonstrated. Conservation of farmyard manure and compost making were also shown. Lectures illustrated by magic lantern slides and movie pictures, were conducted. An exhibition of insects, grains, poultry, bee-hives and bee-tools was also organized.

FRUIT SURVEY

The fruit survey made so far has brought to light 219 varieties of deciduous fruits under propagation in the State. This number includes 111 varieties of apple, 63 of pear, 31 of plum and 14 of cherry. To keep a record of the same for future scientific work, a plant museum has been opened in Srinagar.

A REFERENCE TO TRANSPLANTATION OF PADDY

(*Contd. from page 23*)

(paddy) plants yielded abundance of grain if they undergo the transplanting process. As explained by the commentator, Mallinatha (14th century A.D.) Kalama is a kind of paddy (*kalama sali-visesah*). Amarkosa (4th century A.D.) gives the names of varieties of paddy in the verse *'Salayah kalamadyasca sastikadyasca pumsyami'*. Shankara P. Pandita, one editor of the text (Raghuvamsa) remarks in his notes 'Kalama are plants of rice grown thickly in a field early in the wet season and then transplanted to another soil of a softer nature, about July or August. No particular kind of rice is intended, I think, as any kind of rice is so grown and transplanted, at least in Konkan and in the Dekkan'. A translator of Raghuvamsa, K. M. Joglekar, states, 'Bengal is pre-eminently rice growing country and the description is very accurate.' M. R. Kale, a well-known translator of the text, also mentions in his notes that 'Kalamah—the paddy is a kind of corn first sown in Caitra or Vaisakha in burnt soil and after a month or two transplanted to a softer soil, full of water. When thus transplanted the paddy has a luxuriant harvest. To understand the appropriateness and force of the simile we must suppose that the princes were replaced on their thrones by Raghu after they were defeated and dethroned. Then struck by the magnanimity of the victor and overcome by the gratitude, they came to him with presents, and prostrating themselves before him,

(*Contd. on page 27*)

 (Contd. from page 11)

Shearing in Lathi village in Jaisalmer district

distributed in the northern parts of Jodhpur and Jaisalmer districts. There are two varieties in this type, the brown-faced and the black-faced. Both have long ears and are of heavy build, weighing on an average about 90 lb., growing about 4 to 7 lb. of medium and coarse wools per year. This is also a very well established breed type and its wool yield is the highest of all the breed types in Rajasthan.

Malpura: These sheep are found in Jaipur, Tonk and Sawai Madhopur districts. Their faces are very lightly coloured, appearing almost completely white from a distance, and weigh about 59 lb. They are easily recognisable by the extremely coarse, hairy and straight wool they grow, the production being 1½ to 2 lb. wool per sheep per year.

Sonadi or Chanothar: These sheep are distributed round Udaipur Division and extend downwards into Bombay State. The characteristic features of this breed type are very long ears (about 8 to 10 inches), which trail on the ground as they graze, light brown colour extending from the face upto the neck, and long and heavy body, weighing more than 120 lb. on an average. Their wool production amounts to only 1½ to 2 lb. of washed wool of coarse and almost completely hairy fibres. They are good milkers yielding about 2-3 lb. of milk per day, can withstand heavy rainfall and can easily walk through marshy areas on account of their long and bare legs.

Even from the short descriptions given above, it is apparent that these breed types vary widely in size, weight, confirmational characteristics and quality and quantity of wool production. To what extent these differences are due to variations in soil, rainfall and pasture, how each of these breed types can be further developed to produce more meat, wool or milk and how far it may be possible to combine in one, the good qualities of different types, need investigation. But what the sheep farmers themselves are doing in this direction deserves to be noted.

On account of the hardy nature of the Jaisalmeri and Marwari breeds, their thriftiness, heavier build, higher lambing percentages and quick growth, breeders all over Rajasthan have taken to breeding rams of these two breeds. While this is beneficial when considered from the point of view of the returns to the farmer, the fine wooled Chokla or Shekhawati breed is being slowly destroyed.

The fact that more than 60 per cent of the income of the sheep farmers is derived from the sale of stock for mutton has to be taken into account while initiating schemes for wool improvement in these areas, as any policy which is at variance with the interests of the sheep farmers may not be acceptable to them. Steep fluctuations in wool prices and marketing conditions which sometimes lead to the holding up of the stock of wool with the farmers, adding to the other difficulties they have to face —have led them to pay more attention to improve size and weight of lambs and increase their number rather than on maintaining the quality of wool production.

SHEEP MANAGEMENT

The methods of sheep management vary from region to region according to existing conditions and facilities available in the State. In the southern and north-eastern parts, the farmers usually depend on the community fallow lands near their villages for grazing during the day; in the evening they go to their huts near which the sheep are penned at nights. The sheep are watered once or twice a day out of a well or a tank nearby. The number of sheep in the flocks varies from 30 to 200, and each flock is often a mixture of various breeds and types. The three main sources of income of farmers in these areas are, sale of sheep for slaughter, sale of wool and the fees paid by agriculturists, for holding the sheep on their lands before sowing operations which run upto Rs. 3 a day.

In the northern and western parts comprising of Jodhpur, Bikaner and parts of Jaipur Divisions, the farmers have to depend on vast tracts of land with very sparse vegetation for sustaining their sheep. In these parts the sheep are grazed continuously for two days, keeping them constantly on the move, the shepherd along with his sheep spending the nights in the open. On every third day, the sheep are brought back to their villages for watering. The shepherd also replenishes his stock of provisions and refills his leather

water-pitcher. It is of special interest to note that the sheep in these areas can live on grazing and only a few sips of water once in every forty-eight hours. The size of the flocks varies from 200 to 5,000 in these areas. In addition to paying grazing fees either to the Government or *zamindars,* the sheep farmers here have to spend quite considerable sums of money for watering their stock. Lambing is usually adjusted to occur in August-September when there will usually be tender green grass available for the ewes suckling their lambs, and for the grazing of lambs as well.

A unique feature of sheep farming in these areas is the large scale migration of sheep to river banks in Uttar Pradesh in north-east or in Bombay State in the south, about five to six hundred miles away, for about four to six months a year. Rainfall being very low and confined to two to three months in the year, there is not enough of vegetation round about the villages of farmers to sustain the sheep throughout the year. Hence they leave their homes early in winter in groups of four or five families together with five to ten thousand sheep; in this they are helped by country-bred sheep dogs. On their way at nights, they halt on harvested enclosures of land and incidentally earn some fees from the agriculturists for manuring their lands with sheep castings. After about three to four months with the onset of the summer monsoon, they return home. This move is a characteristic feature of sheep farming in these parts.

These sheep farmers are hardy and experienced in tending to their flocks and their sheep are very well bred, highly uniform in confirmation and type, as compared to the stationary sheep farmers and their stock in the eastern regions.

SHEEP AND WOOL TRADE

About seventeen to twenty-one million pounds of wool are shorn, collected and sold every year in the State. Sheep are shorn throughout the State by country-made hand shears and the fleeces which are neither skirted nor graded are collected together and sold either by weight or by number of sheep sheared, to either the local general village merchant or an itinerant small wool merchant. After passing through two or more hands, these stocks of raw wool reach big wool markets in Pali or Bikaner in Rajasthan or Beawar in Ajmer State. In these markets they are cleaned, deburred, graded and blended according to the individual prescriptions of wool exporters, and pressed into bales of 320 lb. each. Smaller quantities of wool also reach wool markets at Fazilka, Panipat or Delhi in the north or Rajkot in the south-east. Most of these bales are then sent through exporting houses to Liverpool to be auctioned while some are sent to the United States, Canada or Australia. Considerable quantities of either raw wool or baled wool are also bought by mills, carpet manufacturers and hand spinners in India. The wool is exported under various trade names.

Rajasthan exported sixteen and a half million pounds of wool in 1950-51 and twelve and a half million pounds in 1951-52. It is expected that the figure for 1952-53 would be about 25 million pounds, nearly double of that of the previous year. This is presumed to be due to the disposal of accumulated stocks because of favourable marketing conditions, better prices and greater demand for Indian wool at Liverpool rather than to an increase in production. Added to internal consumption for meat which is estimated at about 15 lakhs, four lakhs of sheep, were exported annually during the last three years from the State to feed the slaughter houses in Uttar Pradesh, Delhi and Bombay States. The total value of sheep and wool exported from this State is estimated to be nearly five crores of rupees.

FUTURE OF SHEEP FARMING IN THE STATE

As more and more land is being claimed for cultivation with the extension of irrigation facilities, sheep are slowly being driven out into semi-desert areas. However, with the improvement in the management of grazing areas and the effective control of the expansion of the desert as planned by the Forest Department, carrying capacity of land can be increased. The introduction of land reforms and levying of grazing fees on an equitable and long term basis and better facilities for watering of sheep, will no doubt ensure stability of the sheep farming industry. Better management, preventive measures against contagious diseases and more efficient and economic methods of wool collection and marketing will also go far towards increasing the production of wool and making it more profitable. The market value of the mutton and wool will have a direct bearing on the future of sheep farming. While there is a steady market for mutton within the country, the major portion of the wool is shipped to foreign markets for disposal. There is a growing fear that artificial fibres may eventually displace wool or render it secondary in importance. Fibres like viscose, Fibro and Fibro-lane are being increasingly used in the manufacture of carpets abroad especially in the United States. However, there has been no sign of the slackening of the demand for our wools from the main markets abroad.

A REFERENCE TO TRANSPLANTATION OF PADDY

(*Contd. from page 25*)

offered them. The simile here is appropriate both as regards time and place. The paddy flourished in water and so did the Vangas, who were great navigators (Nausadhanah) and Raghu attacked them at a time when the paddies were probably bent low on account of the weight of the corn.'

In Raghuvamsa and other works of Kalidasa we read of many kinds of paddy sown, namely, Sali (Raghu IV.20), Kalama (*ibid*, IV, 37) and Nivara (*ibid*, I. 50; Sak. I. 13) besides various other grains —barley (*bijamkura*) (Raghu VII, 27), a kind of small sprouts of barley (*yavamkura*) (*ibid*, XIII, 49), Sugarcane (Raghu IV, 20), *tila* (*sesamum*) (Sak. P. 49) and saffron (Raghu IV, 67). These appear to have been extensively grown and harvested in India in the time of Kalidasa.

FISH CULTURE IN TRIPURA STATE

By S. K. BANNERJEE and A. L. MUKHERJEE

UNTIL the partition of the country a large number of water areas in the State of Tripura were allowed to go wild with rank vegetation and weeds, and they were not fully utilized for fish culture, as the State's requirements of fish used to be mostly met by imports from East Bengal. A few fish culturists also used to obtain their supply of fish seed from East Bengal. But with the gradual decrease and subsequent stoppage of imports of fish and fish-seed from that source, greater attention is now being paid by the Government and the fish farmers for utilizing larger water areas for fish culture. These waters, if reclaimed and developed, will not only meet the demands in the State, but can also supply the needs of the neighbouring areas. In view of the difficulty of importing fish-seed, it is equally necessary to locate fish-seed sources in the State.

Rudrasagar Lake, the largest water area in the State, has been declared as a 'reserve'. This lake has a water expanse of 2,720 acres and is situated 32 miles south of the Capital, Agartala. In winter, about 600 acres of land on the adjoining areas become available for Boropaddy cultivation. This area has been handed over to the Refugee Fishermen Co-operative Society having 600 refugee fishermen families as its members. Considerable progress has been made both in rehabilitation and fishery development. In addition to building their houses, improving the water areas and cultivating the paddy fields, these fishermen sold fish worth Rs. 44,453-10-0 at the end of the first year. During this period they delivered to the Government procurement agency 606 md. of paddy voluntarily, after keeping sufficient quantity to meet their own requirements. In 1951-52, 50,000 fry and fingerlings reared in the nursery tanks were introduced into the lake. In 1952-53, it was further stocked with seven lakh carp fry. The sale of fish caught from the lake realised a sum of Rs. 44,614-7-9. With the construction of a sluice gate in the channel connecting the lake with the Gumati, construction of a few more nursery and rearing tanks and a safe embankment, it is estimated to raise the production from this lake to about 2.3 tons of fish per day.

The large number of big tanks or *dighis* in Udaipur, former capital of the State, which are choked up with weeds, can also be converted into productive areas after eradication of weeds. It has been proposed to take 100 acres of such water areas to serve as demonstration farms for creating interest in fish farming amongst the local people. Three tanks, Jaganath - Dighi, Bejoy Sagar and Amarsagar, covering an area of 100 acres, have been settled for ten years on an annual lease of Rs. 1,000 with a private company called the Tripura Fisheries and Industries Ltd. One tank was cleared of weeds by the company in 1949-50 at a cost of Rs. 24,000. So far, fish worth Rs. 18,000 has been taken out from this tank. The other two tanks were cleared by the company on the basis of 2/3 and 1/3 shares of catches. The monthly income from these tanks has been estimated to be about Rs. 2,500.

It has been proposed to bring under culture similar water areas either by the Fisheries Department or by leasing them out to private fish farmers. It is also proposed to establish carp fry distribution centres at Rudrasagar and Udaipur areas, besides the one at Agartala, in order to meet the demands of fish farmers.

COW-DUNG GAS PLANTS

(*Contd. from page 18*)

cow-dung slurry passes through them all and gets completely digested. The gas produced in each drum is led into a common pipe, which is connected to a gas-holder, also made of crude-oil drums one inverted into another.

To come back again to the starting place where all this development had its origin in 1939, viz. the Indian Agricultural Research Institute, New Delhi, this Institute has recently set up a large-sized gas plant, which can produce about 400 to 500 cu. ft. of gas per day. The object of this new plant is mainly experimental; to examine more fully the scientific principles underlying the process, with a view to (a) finding out better conditions and isolating better strains of bacteria which would yield a higher production of gas than is obtained in the existing plants; (b) devising suitable methods for utilizing other types of refuse material besides cow-dung, e.g. vegetable litter, waste straw, weeds, *bhusa*, etc.; and (c) examining the quality of manure produced by the process and its crop producing value.

 (Contd. from page 9)

Besides cane, *Pyrilla* has been observed to feed and thrive on many other crops like wheat, barley, oats, *chari,* maize, *bajra, burn* and all sorts of grasses. It is mostly on these alternate hosts that the overwintering generation of nymphs develops into adults in the absence of any cane crop during February and March. During April and May when the planted canes have grown to some height, they migrate to these canes. Both the adults and the nymphs in their thousands cause damage to the cane by sucking the leaves of their sap from their undersurface. At times of serious outbreaks of the pest the attacked leaves look whitish from the undersurface and they gradually become pale and wilted due to constant and continuous draining of sap by millions of *Pyrilla* and their progeny, young and old. The growth of the plants is arrested to a great extent. Besides, the pest also exudes a sweet transparent liquid known as the 'honey dew', a very suitable medium for the germination and growth of specis of black fungus, *Capnodium.* This completes the destruction of the plants begun earlier by the leaf-hoppers. The crop that survives this double attack is rather poor, both in quality as well as quantity. *Pyrilla* has been observed to prefer broad-leaved succulent varieties of cane to thin-leaved varieties. Excess of nitrogenous manure to cane results in the production of more succulent leafy matter which invites the pest in larger numbers and results in very severe damage to the crop.

HOW THE PEST MULTIPLIES

The adults mate soon after emergence. Mating takes place generally during day time. In an infested field it is a very common sight to see several couples in copulation. The pre-oviposition period varies from a few hours to a few days depending upon the weather conditions. Eggs are laid invariably on the undersurface of the sugarcane leaves. During years of serious outbreak, however, they are laid in any part of the plant and may even be laid on weeds and grasses on the bunds of sugarcane fields and on wayside trees nearby. From October onwards eggs are laid more in dry leaf-sheaths where there is both warmth and shelter. Very few eggs are laid on exposed leaves during these winter months. The number of eggs laid by a single female depends on the season. More eggs are laid by one female during May and October, the number being about 400. A fefemale lays a total of 800 eggs during her life-time. Eggs are laid in clusters of 20 to 50. Each cluster measures 30 to 48 mm. in length and 6 to 10 mm. in breadth and comprises of 2 to 3 longitudinal rows.

As soon as the eggs have been laid the female deposits on them some cretaceous white thready material from her anal pads which affords protection, both against enemies and unfavourable weather. When freshly laid the eggs are of greenish-grey or pale white to light bluish colour. Each egg is cylindrical in shape and rounded at both ends and measures 1.0 mm. long and 0.5 mm. broad. The eggs hatch in about seven to ten days during the summer months. The incubation period extends even to a month during the winter months. The nymphs on hatching remain congregated together near the egg-mass for about a couple of hours after which they become active and then jump from leaf to leaf. The newly hatched nymphs are milky white in colour and have two characteristic anal filaments. They generally feed on the lower surface of the leaves near the mid-ribs and are very restless. The nymphs pass through five stages of growth and the total nymphal period occupies from one to two months during April to September and as many as five months during the colder weather. The adults are fairly long lived, the maximum longevity being six months with an average of about one and a half months. The females live longer than the males, except during summer when they die soon after oviposition. The total life-cycle from egg to adult stage occupies about two months during April-June and four and a half months during the winter months. From May to December all stages of the pest are met with in the sugarcane fields. Eggs laid in November-December hatch out in January and from January to March the

pest is present in the field mostly in the nymphal stages. These nymphs become adults by the end of March whence oviposition begins and the life-cycle is started afresh. There are at least three to five generations in a year depending on the climatic conditions of the region.

CONTROL MEASURES

In no other pest, perhaps, nature plays such an effective role to keep down the population of the pest as in the case of *Pyrilla*. There are a number of natural enemies that attack the pest in the egg stage, in the nymphal stage and even in the adult stage. This is a fine example where a sequence or chain of natural enemies attacks the same pest in the different stages of its growth and development. The eggs of *Pyrilla* are parasitized by a number of chalcid parasites. Unfortunately, many of these that sometimes effect as much as 90 per cent parasitism, appear rather late in the season. From October onwards *Pyrilla* starts laying eggs in leaf-sheaths and observations and research work carried out at the I.A.R.I. show that the parasitization of egg-masses in the leaf-sheaths is not so high as in the case of the exposed egg-masses laid on leaves from July to September. The nymphs are attacked by two Dryinid parasites and the adults are attacked by an endo-parasite popularly known as 'Stylops'. It may, however, be emphasised that but for the activities of these parasites the problem of *Pyrilla* control would have been far more serious than what it is today. Experiments carried out at the I.A.R.I. for a number of years by collecting and conserving egg-masses in suitable wire-gauze cages, through which the parasites can emerge out but not the newly hatched *Pyrilla* nymphs, have given encouraging results in the control of *Pyrilla* to some extent. In these conservation experiments the parasite population in the field is increased in relation to the pest population, and so a measure of successful control of the pest is achieved. Similar results have been obtained in Bihar and the conservation of the eggs has proved beneficial in both increasing the percentage of parasitisation and reducing the number of egg-masses besides, of course, increasing the yield. In small holdings as well as in larger areas where a sudden increase in the population of the pest is observed, the following control measures may be adopted on a field scale:

(1) *Pyrilla* egg masses which are conspicuous against the green background of the leaves may be collected every week and destroyed. Destruction of the eggs early in the season will definitely bring about a reduction in population later in the season.

(2) The adults and nymphs may be collected with the help of large hand-nets and killed by throwing in kerosinized water.

(3) Spraying may be carried out with 0.25 per cent BHC or DDT (water suspension) at the rate of 50-60 gallons per acre, in the pre-monsoon and 100 gallons per acre, in the post-monsoon periods. To avoid the destruction of the beneficial parasites and ensure an effective measure of control of the pest, it is recommended that the sprayings should be carried out in the pre-monsoon period when the parasite population in the field is negligible. Spraying with these insecticides should be done with great caution and under expert supervision.

(4) Dusting may be done with 4-5 per cent BHC at the rate of 20 and 30 lb. per acre in the pre and post-monsoon periods, respectively, with great caution and under expert supervision.

In both (3) and (4) above great care should be taken that the beneficial parasites are not destroyed.

OUR BOOK SHELF

APPROACHES TO COMMUNITY DEVELOPMENT. Edited by Phillips Ruopp with a foreword by S. Radhakrishnan; published by W. Van Hoeve Ltd., The Hague, Bandung; pp. xvi + 352, price sh. 20.

A symposium introductory to problems and methods of village welfare in underdeveloped areas. Conceived as it is as a general introduction to the social reality in which welfare projects at the village level must be undertaken, it may be of interest to field workers and administrators, students and laymen.

GOOD FARM CROPS by A. W. Oldershaw

GOOD CONTROL OF INSECT PESTS by S. G. Jary

GOOD FARMING BY MACHINE by H. J. Hine

Three further volumes in the simple language, 'Teach Yourself Farming' series of books published by Hodder and Stoughton for the English Universities Press, Ltd., London, are priced Rs. 4-14 each. Amply illustrated. These are available in India from M/s. Orient Longmans Ltd., Nicol Rd., Ballard Estate, Bombay 1.

MAN OF THE MONTH

(*Contd. from page 6*)

The balance will be spent on some charitable purpose".

The second question related to his son. "Now that your boy is an I.A.S. officer, will you give up work in your fields?"

The eyes flashed hidden fire: "Never" was the decisive answer. "Let Babu Saheb become a big man in his field (of work) I shall be, in mine." The old man glowed with the pride of possession of both, his son and his work, but if ever there came a time for him to make a choice between the two, there was little doubt of what he would do. Only death could separate him from his land. This was the last reply he gave me.

A NEW ECONOMIC 'JOWAR'

(*Contd. from page 19*)

As a fodder crop it has been found to out-yield the *Irungu cholam*. It has also been found to be drought-resistant. As a grain crop it has recorded 50 per cent higher yield of grain in the Madurai tract. It has spread over more than 1,000 acres within two years of its release, and is expected to completely replace the *Irungu cholam* in ten years' time.

As an irrigated crop it has been found to come up well when grown during the months of June, July, August and September recording acre yields of 3,000 lb. of grain and 15,000 lb. of dry straw growing to a height of 12 feet. This new variety is a boon to the cultivators of the Madras State, and may have a future in the other States also.

RUST-RESISTANT WHEAT VARIETIES

(*Continued from page 21*)

three places either to a smaller or greater degree. Types N.P. 710, N.P. 715, N.P. 760, N.P. 797 and N.P. 798 gave definitely higher yields, the yield figures varying between 17 to 23 md. per acre at Junagadh, whereas the local red yielded only 6 md., its average yield during the rust-free year being 10-12 md. However, from the study of seeds, it was apparent that the seeds of all the N.P. types were affected by rust, percentage of attack ranging from 10 to 54, except in the cases of N.P. 720 and N.P. 781 which, alongwith the local red, had cent per cent rust-affected seeds. A laboratory study of ear characters at Botany Division, Indian Agricultural Research Institute, New Delhi, shows that varieties N.P. 797 and N.P. 798 have very bold grains. These two types are practically awnless and also early maturing than the local red, thus saving one irrigation. All the other N.P. types have practically the same maturity period as the local red. It may also be added that the N.P. wheat fetches better price in the market than the local red, because it gives good quality *atta* of white colour.

Thus the farmers in Saurashtra can choose an awned variety from among N.P. 710, N.P. 715, and N.P. 760, and an awnless variety from among N.P. 797 and N.P. 798. These varieties give higher yields than the local variety even during rust-free years, have better quality grain, and escape the attack of rust.

INDIAN FARMING

Vol. III New Series No. 10 Jan. 1954

EDITOR'S PAGE AND EDITORIAL NOTES 2
MAN OF THE MONTH (Feature Article)—A. R. Vyas 4
EFFECT OF FERTILIZER TREATMENTS ON OATS AND BERSEEM IN THE PUNJAB —H. C. Malik 7
THE PAINTED BUG, "BAGRADA CRUCIFERARUM" KIRK —E. S. Narayanan 8
KEEPING ANIMALS HEALTHY WITH THE USE OF VETERINARY BIOLOGICAL PRODUCTS —Balwant Singh 10
NILKALAMI — A MENACE TO SUGARCANE CROP —C. Thakur & H. N. Singh .. 12
DOES JUTE CULTIVATION EXHAUST THE SOIL? —B. C. Kundu & M. K. Mukherji 14
EAT MORE AND BETTER EGGS —T. S. Krishnan 16
CASTRATION IN LIVESTOCK —S. P. Beri 21
MANUFACTURE AND PRESERVATION OF SEMI-DRIED PRAWNS —R. Venkataraman & A. Sreenivasan 22
CULLING—A MEANS FOR IMPROVEMENT OF SHEEP —B. B. Buch & S. Jayaraman .. 24

★

EDITORIAL BOARD

Printed and published by P. H. Raman at the Associated Advertisers and Printers Ltd., 505, Arthur Road, Tardeo, Bombay 7.
(Agents for Indian Council of Agricultural Research, New Delhi.)

ADVERTISEMENT RATES

CURRENT:
CASUAL

Full Page	.. ..	Rs. 450/-
1/2 Page	.. ..	Rs. 225/-
1/3 Page	.. ..	Rs. 150/-

CONTRACT CONCESSIONS:

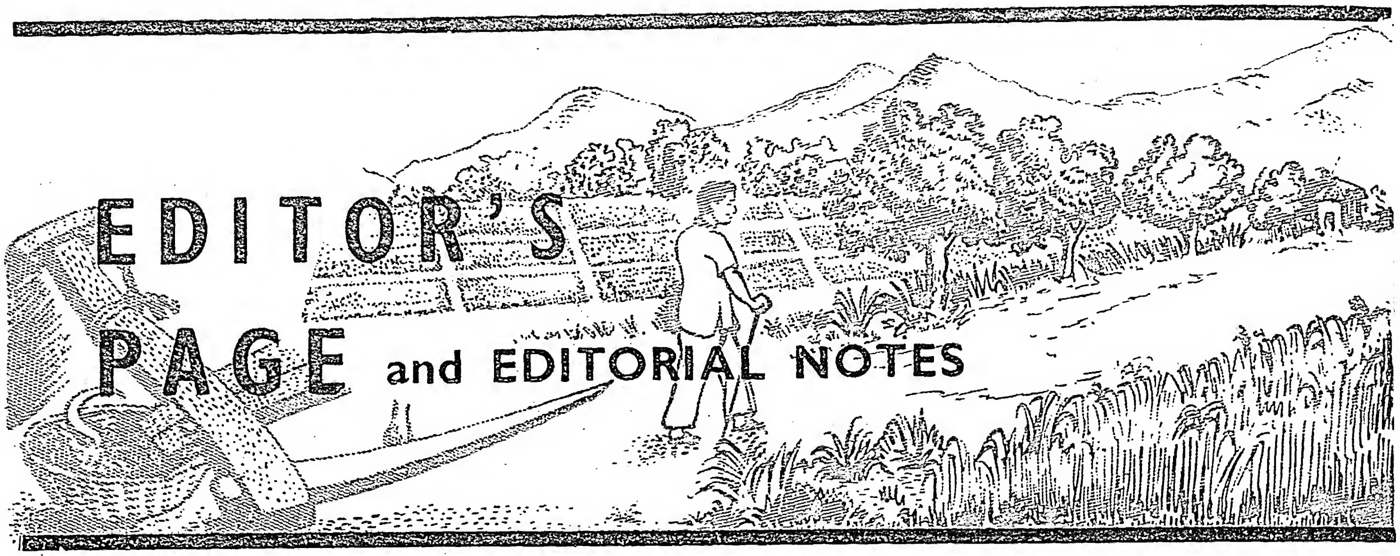
6 INSERTIONS	12 INSERTIONS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

Effective from October 1952 until further notice.

SUBSCRIPTION RATES

Annas 12 only per copy
Rs. 9-0-0 for 12 issues
Rs. 4-8-0 for 6 issues

All Business enquiries may be addressed to the "Agents" at 505, Arthur Road, Tardeo, Bombay 7.



Sometime back, to be precise in November 1952, an Agricultural Information Conference was called at Lucknow by the Indian Council of Agricultural Research. The Conference discussed the general agricultural information set-up in this country and stressed the need for establishing a net-work of information centres right from the Central headquarters to the village level. The Conference aroused great expectations among interested people and a plan was visualized to ensure a steady flow of useful technical information from the laboratory to the field. It was contemplated at that time that the information to be thus passed on should relate not only to agricultural and animal husbandry problems or subjects but also to other aspects of rural life. It was realised that while laboratories would be increasingly linked with the fields, the second line of communication connecting the fields with the laboratories was sadly missing. It was, therefore, felt imperative that this vital link should also be established.

It must be admitted that we are at present living in a world which is daily seeing change of values and increasing importance being attached to hitherto neglected aspects of life and work. In face of this, preservation and continuance of useful established practices which cannot be challenged by improvement in scientific knowledge or technique seem to be essential. But even such accepted ways of agricultural production, and much of the newer innovations which the farmer adopts will certainly throw out problems which can possibly be solved with the help of experts. The farmer in that case should not only be entitled to have useful technical information from laboratories passed on to him but also to send up any problem that confronts him in his day to day life to experts for research and solution. The development of this line, however, will to a great extent depend on the initiative of the farmer himself. For, he alone knows best the problems that confront him in the field. But even then the technician should be receptive, his attitude encouraging, and his approach appealing to the imagination of the farmer. Such a stand will tend to create confidence in the farmer and educate him to look upon the experts not as distant aliens but as fellow human beings whose hands are always stretched out for advice, help and service.

If this is accepted as the plan of how things are to be shaped in the sphere of agricultural information, it requires to be seen how far this conception has actually been adopted. If this has been adopted at all, it remains to be seen how far the plan of agricultural information set-up has really been executed. It must be admitted at the outset that this being almost a new venture in this country, the progress must necessarily be slow. This has to be so, especially because the background against which this information service is to be conceived is much too crowded with established practices probably, in many cases, without any relation to scientific research and progress.

A meeting of the Central Agricultural Information Committee was held for the first time in Delhi in December 1953. In this Conference many items of work in the sphere of information service were discussed. The Conference once again emphasized that the progress will not be ensured only by stressing the work at the Centre or at the State headquarters. A uniform plan of work should be developed which should reach right down to the village level. This is a lead in the right direction in view of the fact that it is in the villages that the unit of agricultural operations is situated and any plan of work, which, in its zeal of going ahead, leaves the rural areas behind in

its organizational set-up and bestows undue attention on certain selected and specific focal points, is bound to be misleading and fail miserably.

As decided by the Agricultural Information Conference at Lucknow, the Indian Council of Agricultural Research was made responsible for implementing the recommendations adopted therein. As a test case the Council planned a programme of informational work publicising the Japanese method of paddy cultivation. The programme was planned out from the Centre. But the entire agricultural set-up of the country was taken into consideration before it was finally adopted and taken down to the State headquarters, districts, *tehsils* and ultimately to the villages. A large amount of literature was specially prepared on the subject giving practical instructions on the technique of the Japanese method of paddy cultivation. These were sent out to various parts of the country where they were translated into regional languages so that even farmers with only limited ability to read could follow the hints given therein. It may be worth while to mention in this connection that the language used in the preparation of this literature was of the simplest kind and gave the instructions in as direct a manner as possible so that the reader might not misunderstand the meaning and significance of the instructions. Not only the written literature but also posters, film strips, flannelgraphs and other visual aids were taken recourse to for this programme of countrywide publicity. The results achieved were indeed very encouraging and from the large number of acres put under the Japanese method of paddy production, it could be safely stated that the programme was a very successful one. The conclusion, therefore, appears irresistible that such other programmes, if planned on a countrywide basis, are likely to yield equally successful results.

As an integral part of the agricultural information set-up, Information Committees have already been established in a number of A, B and C States in addition to the one at the Centre. Information programmes require rapid production of necessary literature; as such it is imperative that provision should be made at the Centre as well as at the State headquarters for the production of this essential prerequisite. In view of this, it has been decided to help many of the States with suitable facilities for the production of requisite material which could be useful to the farmers in their day to day operations during the cropping seasons.

The information work as envisaged at the Lucknow Conference will inevitably be slow to take shape. This is a vast country with different agro-climatological regions. Thus a great variety of problems is likely to crop up. The nature of information to be passed on will vary not only with particular problems confronted with or with climatological regions but also with the receptive capacity of groups of farmers or an individual in a selected area. The experience gained in the working of a programme will go a long way to modify it if necessary, in order to adapt or

(*Contd. on page 30*)

Shri Jayaram Krishnarao Gaikwad

MAN OF THE MONTH

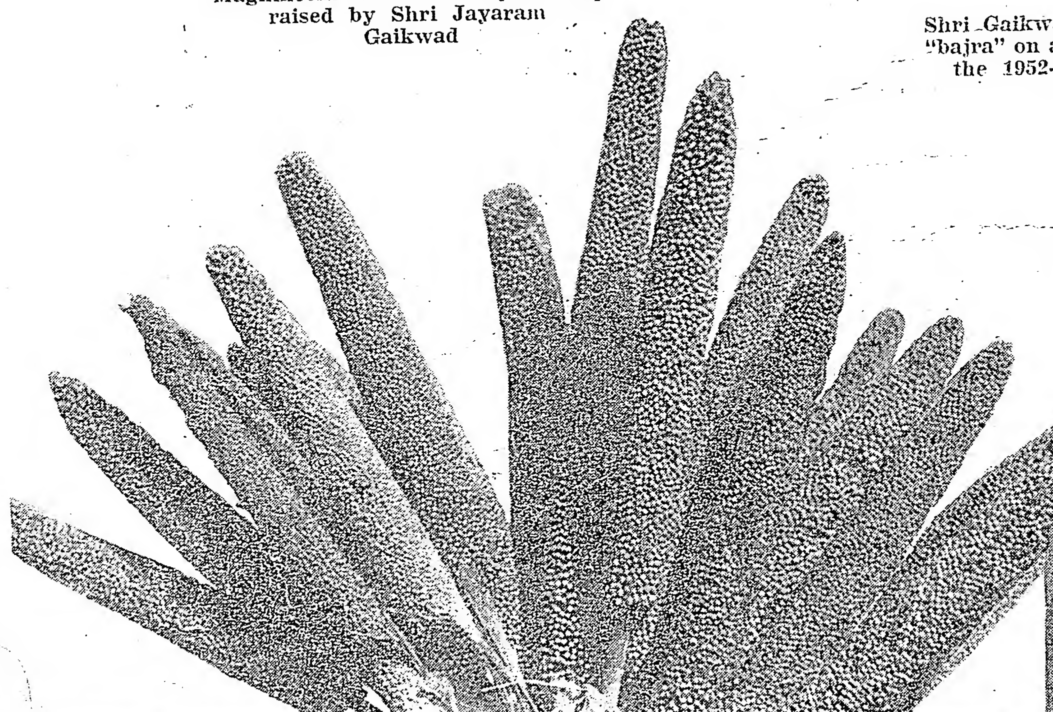
Nasik Farmer Se[ts] New Record [in] BAJRA yield

By

A. R. VYAS

NASIK town is a centre of pilgrimage; the district, according to its agricultural officer, stands first in the Bombay State for its largest acreage under *bajra*, the largest area under wheat, the largest under onions and the largest under grapes. To these distinctions must be added still another, of producing prize-winning farmers.

Magnificent cobs of "bajra" crop raised by Shri Jayaram Gaikwad



Shri Gaikwad raised 4,578 lb. of "bajra" on an acre of land during the 1952-53 "kharif" season

Shri Gaikwad has three sons; two are graduates, one in agriculture and the other in mathematics. The youngest, Ramrao, a student of the Intermediate class, helps his father to manage the farm

For, Shri Jayaram Krishnarao Gaikwad, the winner of the first prize in the *kharif* crop competition for *bajra* held at the State level in Bombay who produced 4,578 lb. on an acre, belongs to village Ojhar in the Nasik district. I had the good fortune of meeting this enterprising farmer last September, for his fame had travelled beyond the confines of his small village, which lies about 12 miles from Nasik town on the metalled Bombay-Agra Road.

Accompanied by Shri Phadtare, the Agricultural Officer of the district, I met Shri Jayaram Gaikwad at his spacious village house, which stood out from the rest of its surroundings by its cleanliness and sense of permanence. That was also the impression I got of the man, as we talked quietly over a cup of tea. His was an orderly mind, which through years of experience of agriculture, had come to the conclusion that there was stability in the land.

Fifty-nine-year old Jayaram seemed to me taciturn by nature. No waste of words in his speech; his answers often in monosyllables were brief and to the point. He spoke to me in English but when he wanted to drive home a point, he fell back on his native Marathi. His family, he told me, were professional agriculturists, and he had about 80 acres, half of which were under *bajra* last *kharif*. He also grew onions, sugarcane, vegetables and wheat.

METHODS USED

From the large area which Shri Gaikwad put under *bajra,* I gathered that he had concentrated much of his efforts on this crop. I asked him the secret of his outstanding success.

"The use of improved seed, proper tillage, plenty of manure, and adequate and timely irrigation", he replied.

This was not enough for me. I wanted more information, fuller details. Bit by bit, through the assistance of the Agricultural Officer, I was able to piece the following story.

The soil on which the *bajra* crop was raised was of the medium black type. Onions had been raised on it earlier for which the land had been heavily manured. After the onion harvest, the land had been harrowed three times. *Bajra* seed of the Akola variety was sown at the rate of 14 chhataks an acre, with a seed-drill in mid-July, the space between two furrows being about nine inches.

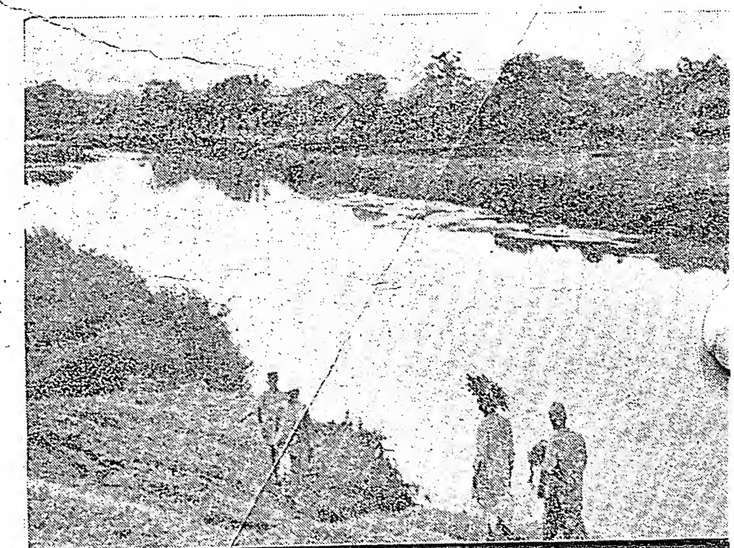
Before the land was sown, the following doses of manure were applied in it: four maunds of manure mixture, 2 cwt. of ammonium sulphate and 5 md. 10 sr. of cake-meal. The germination of the crop was excellent.

From the time of sowing till almost harvest, at intervals of two weeks, weeds were removed. The crop was intercultured three times, the first time three weeks after its sowing, then at an interval of a week each time.

To make up for the deficiency in rainfall, Shri Jayaram used well-irrigation. When the crop was four weeks old, it was manured heavily again. The manures used were: four maunds each of ammonium sulphate and groundnut cake, eight pounds of borax, six pounds of manganese and four pounds of copper sulphate. I was told by the agricultural experts that the use of the last three items had greatly helped in the production of a bumper crop. When it was harvested in the first week of October last year, it stood over eight feet high. The standing crop this year too had already reached a magnificent height when I saw it. The determination of Shri Gaikwad to compete for the all-India first prize in *bajra* during the 1953-54 *kharif,* I realised, was no wishful thinking. He has already lowered the last all-India prize win-

A view of Jayaram's "bajra" crop which stands nearly eight feet high

A view of the Bana Ganga river which skirts Jayaram's estate and provides irrigation



ner's record in *bajra* by over 2,250 lb. an acre. This Nasik farmer needs watching, for 'Rao Saheb' as he is affectionately called, is known all over the district as the 'most progressive' cultivator.

PROFIT AND LOSS

I have always been interested in the economics of such high yields. I pursued the same line of enquiry with my host of the evening, as we were leaving his fields. The total cost of cultivation of the one-acre plot entered for the competition, he told me, came to about Rs. 400.

"And the income?" I asked.

"The grain was sold at an average rate of Rs. 20 per maund and 300 bundles of fodder fetched about Rs. 150", he replied.

I made a quick calculation, which showed that Shri Jayaram had made a net profit of about Rs. 870 per acre.

I was curious to know some more details of the cost of cultivation. Sensing what I was after, Shri Phadtare of the State Agricultural Department slipped a sheet of paper into my hand. It revealed that the cost of seed and its sowing came to about Rs. 5-12 for the acre, while the cost of manures and their application was Rs. 253! That I suppose was Shri Gaikwad's 'open sesame' to fame. This was confirmed by this farmer's reply to my parting question: "What assistance should the Government give to help cultivators raise their production yields?"

His reply was: "More *bandharas*, more wells and tanks, and a sufficient supply of manures in time." He talked from experience and he should know.

OMISSION

The name of the author of the article entitled "Sheep Farming in Rajasthan" published in the December 1953 issue of Indian Farming has been inadvertently left out. The author of this article is Shri N. L. Narayan, Sheep and Wool Improvement Department, Rajasthan

ANNOUNCEMENT

The Indian Dairy Science Association has organized an Essay Contest open to all *bona fide*-students of dairy, agricultural, Veterinary and other educational institutions and research institutes. The subject of the Essay is "Application of Refrigeration in Improving the Dairy Trade in India". Further particulars about the Contest can be obtained from the Hon. Secretaries, Indian Dairy Science Association, Hosur Road, Bangalore-1.

EFFECT OF FERTILIZER TREATMENTS ON OATS AND BERSEEM IN THE PUNJAB

By

H. C. MALIK,

Economic Botanist (Fodder), Sirsa

OATS make an excellent forage crop for those regions where the spring is cool and moist, and the soil is deep and well-supplied with moisture, but like wheat, they can be adapted to varying soil and climatic conditions and fit admirably well into the regular rotation systems. They are, however, raised primarily at places where moisture is insufficient for berseem production.

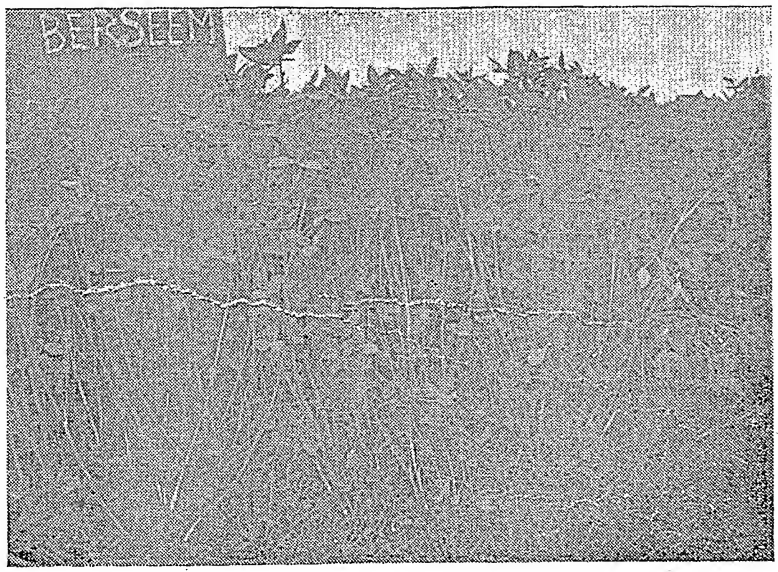
A number of oat varieties, viz. early, medium and late-maturing, have been developed at the Fodder Research Station, Sirsa, Punjab, all of which supply highly nutritious and sustaining forage. Early varieties provide green forage in February, mediums in March and the late ones upto the end of April. Late varieties may even remain green for a much longer period under favourable conditions. As there were wide differences in their yields studies regarding their response to fertilizer treatments with a view to enhancing their forage production were considered necessary.

Five varieties approved by the Department of Agriculture, Punjab, viz. Brunker 10 and Weston 11 from among the early-maturing, Fulgham 15 from the medium-maturing and FOSI/29 and Algerian 19 from among the late-maturing varieties were compared in regular complex experiments for a period of three years from 1950-51 to 1952-53 with a view to studying their response to different fertilizer treatments, viz. farmyard manure 15 tons per acre, 40 lb. nitrogen in ammonium sulphate and their combination on 50 : 50 basis.

Farmyard manure was applied about one month ahead of sowing in order to enable it to become available to the plants and ammonium sulphate was broadcast with the first irrigation given to the crop. The crops were sown in the fourth week of November. They exhibited quite good growth and were harvested at the full bloom stage.

It was observed that the highest forage yields were obtained from the crop to which mixture of farmyard manure and ammonium sulphate was applied, the next fertilizers in order of efficiency being ammonium sulphate and farmyard manure.

(*Contd. on page 28*)

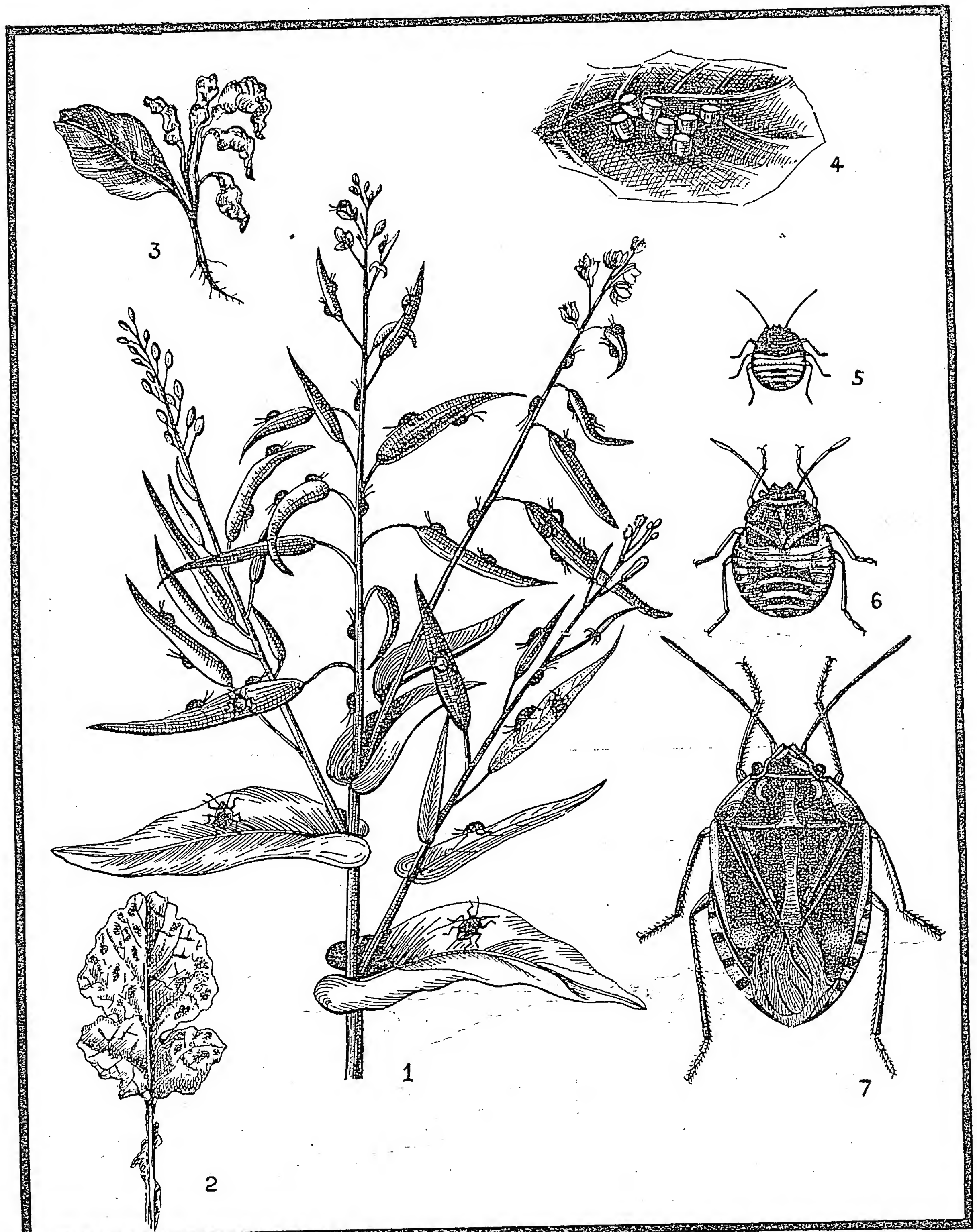


Berseem

SEASONAL PESTS OF CROPS: THE PAINTED BUG, BAG

BAGRADA CRUCIFERARUM KIRK

1. An infested mustard plant
2. A radish leaf that has been partially damaged
3. A mustard seedling that has been seriously damaged, about to die
4. An egg cluster
5. A young nymph
6. A half-grown nymph
7. The adult bug



RADA CRUCIFERARUM KIRK

By E. S. NARAYANAN,
Indian Agricultural Research Institute,
New Delhi

THOUGH the orders to which the beetles and the moths belong contain many serious pests of world-wide importance, they have not gained the same notoriety as the smaller but mighty group of insects to which more than ten thousand species of bugs belong. The simple reason is that beetles and moths are not so loathsome as the bugs, nor do they emit that horrible stench that is characteristic of many members of the bug family. Some species of bugs drink human blood after the fashion of vampires and leeches and are sometimes carriers of agonising diseases fatal to man. These characteristics have made the bugs repulsive and loathsome. The family contains a number of serious pests of agricultural crops and orchard trees. One of the characteristics of these pests is their terrific rate of reproduction. It is this high prolificacy that makes them such devastating pests. Huxley has shown that if all the ten broods of one aphis developed into adults without suffering any mortality, the progeny of the last brood would weigh more than five hundred million well built men. In the following pages the biology and control of *Bagrada cruciferarum,* popularly known as the painted bug, a pest of cruciferous crops, is described in some detail.

Bagrada cruciferarum is a small bug of pretty black and orange colour that drains the life from the cruciferous plants by sucking their sap in its greedy stomach. Though they are found in the field almost every year, in certain years they occur in an epidemic form and the damage caused by them is oftentimes very serious. The young plants that are attacked wilt and die and so resowing of the crop becomes a necessity. Later in the season when mustard, radish, cauliflower, etc. have grown and developed into larger plants, thousands of these bugs cluster over the leaves and pods draining away their life-juice. The seed crops are particularly heavily infested and as a result of this attack both their quality and quantity are severely affected. The pest also thrives well on *Heliotropium* sp. a weed that grows wildly in the field amidst the cruciferous plants. The pest has also been reported attacking coffee, paddy, indigo and sugarcane in certain areas in the Indian Union, but there can be little doubt that these are only exceptional cases. When their population in any kitchen garden is high, they have also been observed to get on to some neighbouring ornamental plants showing thereby the polyphagous habit of the bug. The pest has been recorded on cruciferous plants throughout the Indian Union. Outside India it has been reported from Ceylon, Burma, Kenya, Bagdad and East Africa. Usually the damage is more serious on older plants.

IT MULTIPLIES VERY RAPIDLY

The adults begin to mate within two to six days after emergence. It is a very common sight in the field to see several pairs mating. This is true not only of this bug but many of the bugs that are pests of agricultural crops. The preoviposition period varies from one to two weeks. Eggs are laid daily more than once till the female is about to die. So we see that the prolificacy of the pest is very great and it is this rapid rate of reproduction and the increase of the progeny in geometrical progression that makes this pest in certain years so devastating. Eggs are usually laid in loose soil at a depth of about ¼in. near ant hills, termite nests or even rat burrows. Occasionally, eggs are also laid on leaves, stem and the inflorescence of plants in which case they are firmly glued on to the plant surface by means of a sticky secretion. The bug lays eggs singly or in clusters numbering a dozen or more. The number is particularly high when the eggs are laid in the soil and as many as 75 eggs have been counted at one laying. A female has been observed to lay on an average 15 to 20 eggs a day and a maximum of 230 eggs in her life-time.

The eggs are pale yellow in colour when freshly laid and turn pinkish just before hatching. Each egg is oval in shape and measures about 1 mm. long and 0.5 mm. broad. The eggs hatch in about two to five days. The tiny bugs grow rapidly and after passing through five successive stages of growth develop into winged adults. The freshly hatched nymphs are bright orange in colour with bright red eyes and measure about 1.2 mm. long and 0.9 mm. broad. The fifth stage nymph is about 4.5 mm. long and 3 to 3.2 mm. broad. The adult has a black body with orange or brownish spots. The total nymphal period occupies from three to three and a half weeks. The life-cycle is completed in about 22 days in the case of males and 25 days in the case of females. The males live a little longer than the females, the average longevity of the former being 18 days and that of the latter 16 days. The adults first appear in the field about the middle of October and as they lay eggs at short intervals a very large number of these bugs in all stages is soon found infesting the various cruciferous plants. The activity of the pest gradually slows down by March when most of the cruciferous plants are harvested, and for some time a large number of these are found congregating under heaps of harvested mustard and radish or other dry vegetation or even compost heaps that may be lying nearby. A few adults survive during the heat of the summer taking shelter in crevices in bunds near irrigation channels.

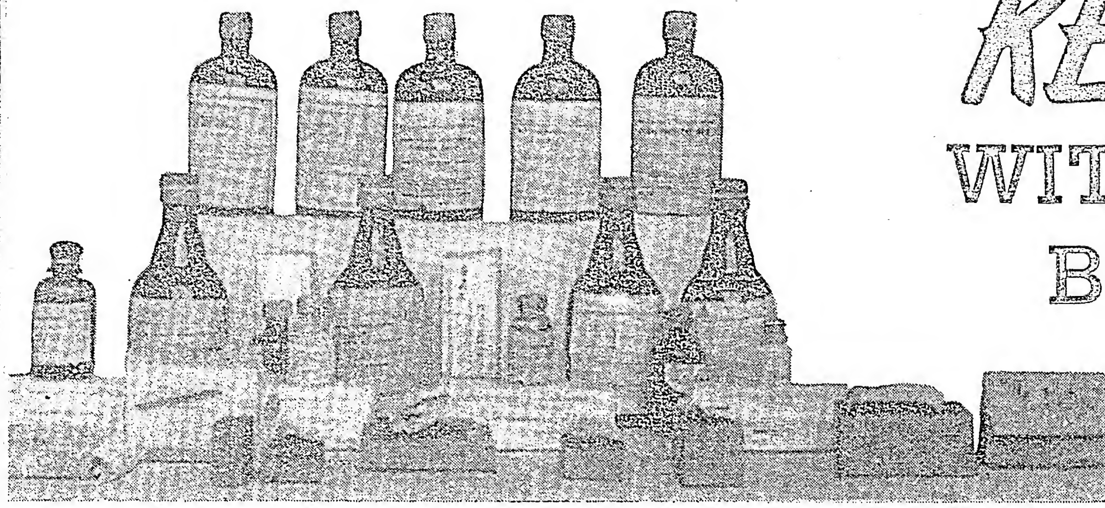
(Contd. on page 27)

KEEPING

WITH THE USE

BIOLOGICAL

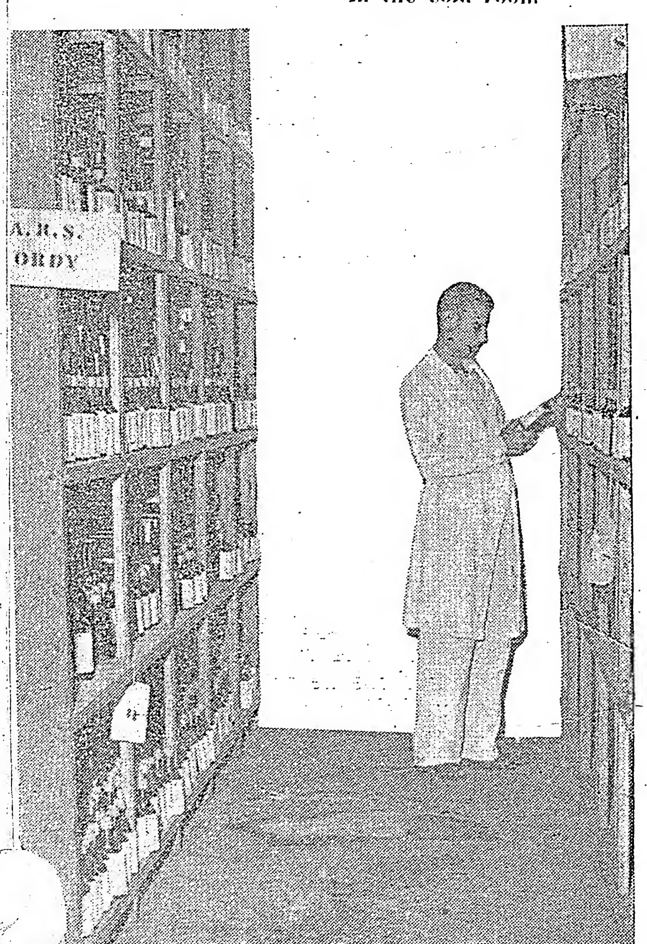
By
BALWANT SINGH,
Head of the Division of
Biological Products,
I.V.R.I., Izatnagar



Various biological products in their respective containers and packings

THE existing agricultural set-up in India in relation to livestock represents a radical change over the old system. Livestock then meant a few animals belonging to the individual cultivator who kept them for plough and milk. But now in modern times when population has increased, distances have been cut short by speedy transport, and increased movement of livestock and human population has been taking place, the problem of keeping livestock healthy has become complex. There is keen competition between man and animal for food and in the long run animals suffer more. Undernourishment and unsuitable weather conditions cause many diseases resulting in a heavy loss of animal life. At home this loss causes great monetary set-back and abroad even our finest animals are not preferred for fear that they will spread cattle pests. As such, the problem of keeping animals healthy with the use of veterinary biological products has assumed importance in the international field. There is an all-round effort to perfect and manufacture veterinary biological products to control animal diseases so that maximum production in respect of work, wool, hides and skins, milk and meat on which human prosperity depends so much, may be attained.

Checking the labels of biological products stored in the cold room



WHAT ANIMAL DISEASES MEAN TO MAN

Man is concerned with this problem from two angles; first his own safety and, second, maximum production. Animal diseases affect him partly because of much financial loss, but mainly because they are communicable. So far it is known that there are at least 55 different animal diseases caused by microbes communicable to human beings. A mad dog is a potential danger to human life and so is the pustule or anthrax. Equine encephalomyelitis, sometime back, caused a heavy human mortality in U.S.A. In Western countries, tuberculosis-infected milk causes tuberculosis among a large number of children. In areas where abortion in animals is caused by germs, the danger for human beings contracting the infection is great.

Apart from this, the monetary loss due to these diseases is very great. In India, the annual mortality in cattle due to rinderpest alone is about $2\frac{1}{2}$ lakhs. This amounts to a loss of nearly $2\frac{1}{2}$ crores of rupees. Great loss is also caused by foot-and-mouth disease. In milch animals there is nearly fifty per cent reduction in the milk yield apart from chronic debility and unthriftiness caused by this disease. Estimates show that about one to five per cent of female animals harbour germs of abortion and one out of seventeen animals becomes unfit for future procreation.

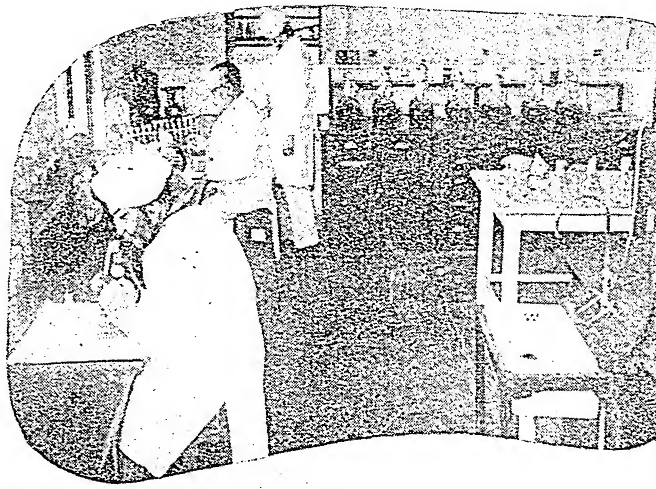
NEED FOR CONTROL OF DISEASES

There is an urgent necessity for thorough control of animal diseases in India, with special reference to an international programme of animal disease control. This is necessary because of migration of livestock from various parts of the world which

ANIMALS HEALTHY

OF VETERINARY PRODUCTS

Conducting microscopic examination (foreground)



may bring into a particular country a disease not already prevalent.

The work of animal disease control at first was restricted to treatment of individual animals. As such there appear in old records, descriptions of many medicines which were used for treatment. But later on it became an established fact that animals must be treated as herds and not individually. In other words, animals must be protected against diseases before the diseases have chances to kill them. For this reason, biological products have become popular.

Checking "p" H of media before using it for the manufacture of various vaccines

BIOLOGICAL PRODUCTS AND THEIR MANUFACTURE

Biological products in their widest sense represent a group of agents which when introduced in the body afford protection against the germs to oppose which these agents have been manufactured.. These also include the extract of some germs which when injected into the body of diseased animals cause reaction by which the disease can be diagnosed. These are known as diagnostic agents and are used to detect tuberculosis, Johnes disease, glanders, etc.

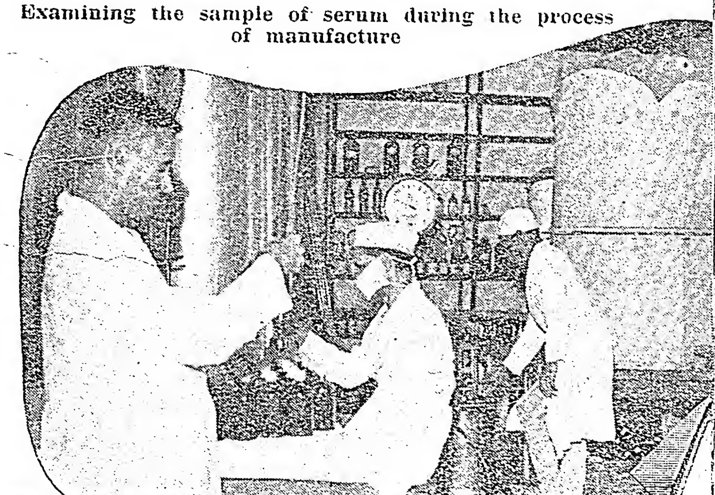
Vaccines and sera are the most important among biological products.

Vaccines represent killed, weakened or living microbes or germs which produce in the animal system antibodies which, in turn, give protection against the disease.

Serum against a particular disease gives a short-term protection.

Vaccines and sera against practically all important diseases of animals are manufactured in India, the largest unit for their manufacture being located at the Indian Veterinary Research Institute, Izatnagar. There are smaller units in the various States also. The annual output of biological products at the Central Unit is more than fifty lakh doses.

Examining the sample of serum during the process of manufacture



The work of manufacture of biological products is a highly complex one and requires utmost care. Elaborate equipment for sterilization, processing of sera and vaccines, freeze-drying of vaccines into absolutely dry form and cold-storage facilities constitute a few of the many necessities of a modern manufacturing unit.

(*Contd. on page 29*)

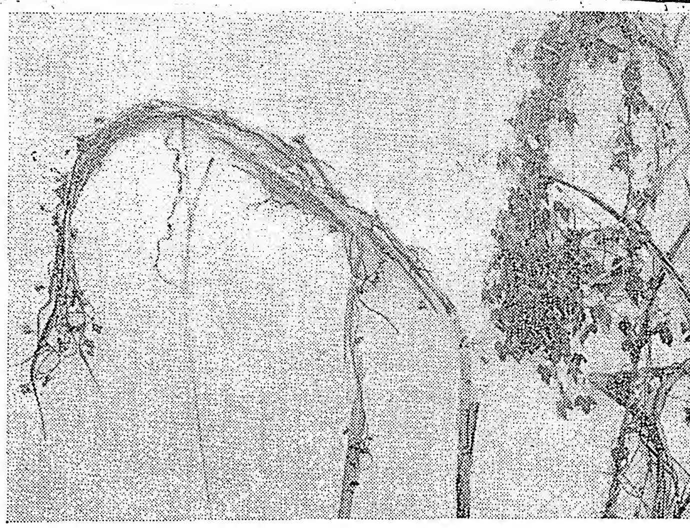
Nilkalami

a menace to Sugarcane Crop

By
C. THAKAR and H. N. SINGH
Central Sugarcane Research Station,
Pusa (Bihar)

NILKALAMI (*Ipomea hederacea* Jacq) has become a menace to the sugarcane growers, causing a loss of 20-25 per cent in the affected fields.

It is one of the most troublesome weeds. It twines round the clumps and sprawls in the field covering four to five rows of the crop. Sometimes, it covers the entire sugarcane field and blocks passages. The sugarcane clumps, as a result of heavy strain, bend



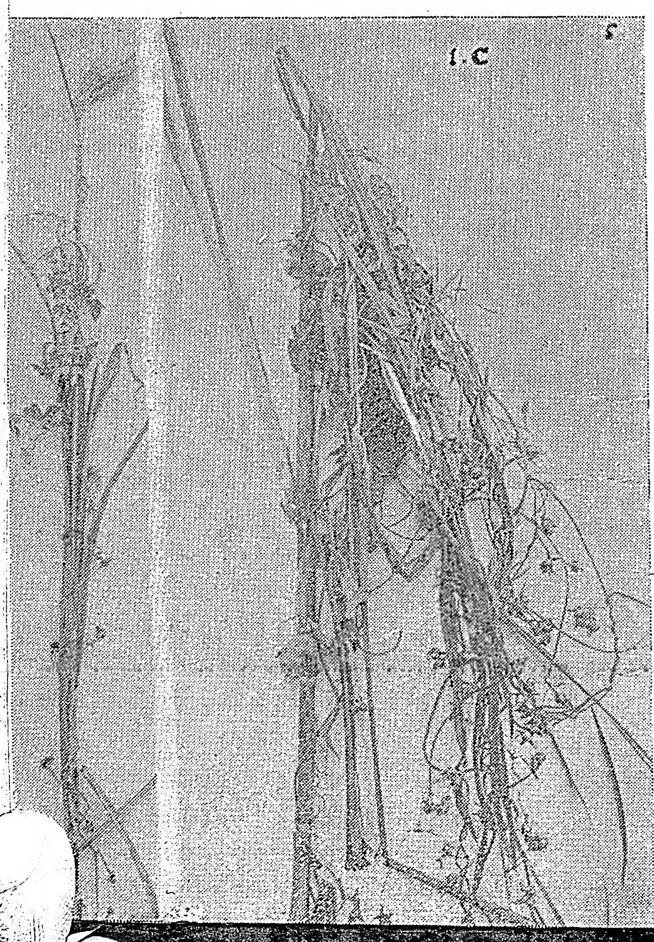
The weed covering the top of the sugarcane plant which has bent down

down and give the appearance of a hedge. Thus the cane tops are damaged, stalks remain undeveloped and the yield is reduced. The weed becomes most troublesome at the time of harvesting.

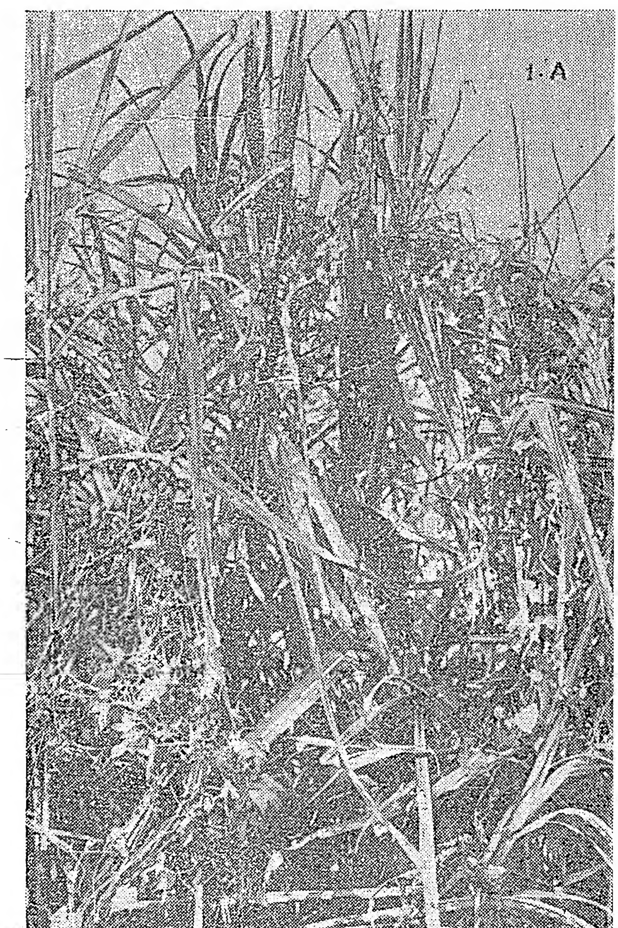
Nilkalami is an annual plant and develops only from seeds. The fresh fruits are used as vegetables and the seeds as a purgative.

A comparison of the affected and unaffected sugarcane clumps indicates that the height and the

The sugarcane top has been damaged by the weed. The growth of the plant has also been affected



A sugarcane field full of "I. hederacea". It shows how this weed twines round sugarcane clumps



weight of the affected clumps are reduced by 20 to 25 per cent.

A survey was conducted at the Pusa Farm (Bihar) to find out the affinity of the weed for the different varieties of sugarcane and other plants. The observations recorded indicated that the weed had a great affinity for sugarcane but did not seem to have any varietal preference. Practically all the varieties of sugarcane growing in the area were found to be affected with the weed.

CONTROL

Clean cultivation, pulling out the weed during the early stages of growth, hoeing and other tillage operations were found to be very effective in controlling the weed.

So far as the chemical control methods are concerned spraying with agroxone (one per cent at the rate of 100 gallons per acre), fernoxone (0.1 to 0.2 per cent at the rate of 100 gallons per acre) and phenoxylene 30 (0.3 to 0.6 per cent at the rate of 100 gallons per acre) gave satisfactory results. Further research in this connection is in progress at the Central Sugarcane Research Station, Pusa (Bihar).

INDIAN FARMING:

SUBSCRIPTION.

Subscribers who have not renewed their subscriptions for the year 1953-54 are hereby requested to do so by remitting Rs. 9/- to the Agents at an early date.

Unless otherwise instructed you will continue to be a subscriber and will get the copies regularly.

Please quote your subscription No. in all correspondence.

Business Manager,
INDIAN FARMING.

DOES JUTE CULTIVATION EXHAUST THE SOIL?

By

B. C. KUNDU and M. K. MUKHERJEE

Jute Agricultural Research Institute, Barrackpore

As a result of partition, the best lands on which jute can be grown have gone to Pakistan, whereas with our changed economy, it has become necessary to produce more jute in the Indian Union. In 1947, at the time of partition, the area under jute in India was only 646,000 acres as against 2,059,000 acres in Pakistan. India's requirement is about six million bales (bale=400 lb.) of which 4.7 million have been produced in 1952-53 from 1,834,000 acres. This shows that during the last few years more than 11 lakh acres of new land have been put under jute. It is not precisely known as to how much of this area is double-cropped with *aman* (winter) paddy. In view of the food position of the country it is not desirable to divert any further area to jute alone. Double cropping in *aman* paddy lands is the only way to bring more area under jute.

Jute is considered by many as a crop which considerably exhausts the soil. In India, by soil-exhaustion, is generally meant depletion of soil-nitrogen. Jute responds to nitrogen very well. The increase in yield is sometimes to the extent of 100 per cent by the application of nitrogenous fertilizers. The increase is not restricted to any particular variety or locality. The response has been more or less universal. As Indian soils are poor so far as nitrogen is concerned, it is often apprehended in many quarters that without very liberal manuring (which is beyond the capacity of cultivators) double cropping with jute and paddy is an impracticable proposition, as otherwise, the already poor Indian soils will be further impoverished.

DOUBLE CROPPING EXPERIMENTS

Double cropping experiments conducted at the farm of the Jute Agricultural Research Institute have shown that the yield of paddy has not been affected (or if at all, to a very small degree) by growing jute as a preceding crop, provided that the transplantation was done at the correct time. Analytical data of soil samples drawn from small plots as well as big ones also show that the soil is not depleted so far as total nitrogen is concerned by growing jute. In the 1952-53 season, 36 comparatively small-sized plots were selected. Representative samples drawn from these plots (in which several varieties and degrees of manuring were included) were analysed particularly for total nitrogen. Mean of the total percentage of nitrogen (for 36 plots) before jute was 0.088 as against 0.991 per cent after jute. This shows that the soils have not been impoverished; on the contrary, they have become somewhat enriched in total nitrogen.

This at first seems somewhat paradoxical; more so, if the stages from sowing to harvesting of jute are considered. In broadcast plots 70-80 per cent and in line plots 40-60 per cent of plants are thinned out normally. This amounts to the removal of a considerable amount of green matter, which has been estimated to be 600-2,000 kg. (1,200-4,400 lb.) per acre, and the consequent withdrawal of proportionate quantities of nitrogen, phosphorus, potassium, calcium, etc. from the soil. The stand or population at the harvesting stage ranges between 80,000 to 2,00,000 per acre.

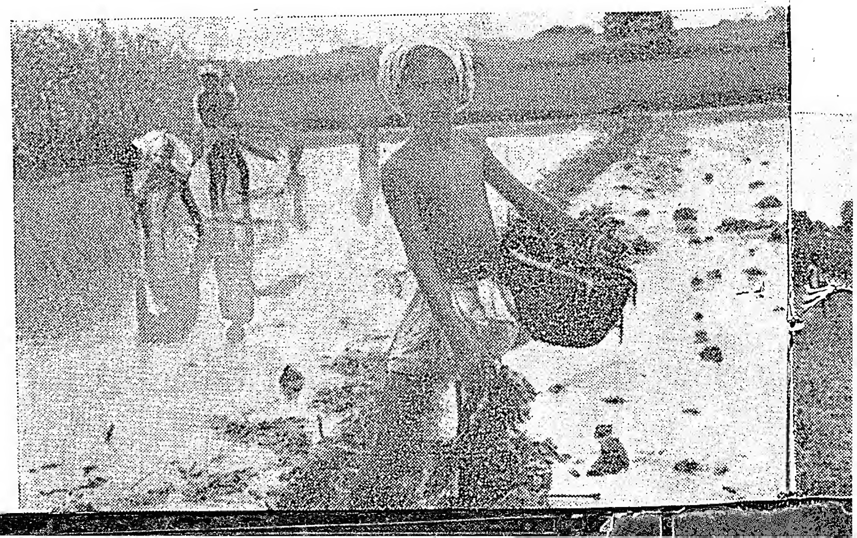
The gross withdrawal of nitrogen by the plants which are harvested may often amount to 100 kg. (200 lb.). About 60 per cent or so of the leaves are shed during the growth of the plant. Therefore, when determining the exhaustion, the natural return of the leaves, containing three to five per cent of nitrogen by weight, to the soil is to be considered. If the natural return of nitrogen from leaves to the soil is considered, the net exhaustion of soil due to plant growth amounts to 20-40 kg. (44-88 lb.) of nitrogen per acre. This amount is very difficult to determine by soil analysis; even then there should not be any increase in the total nitrogen content of the soils after a crop of jute, although this has been observed.

ROLE OF JUTE LEAVES

Investigations were undertaken to find out causes of this apparent anomaly. The fact that

Lodging in plots treated with compost (left); No-lodging in plots treated with superphosphate (right)

Spreading jute leaves in the paddy fields



organic matter increases the total nitrogen content of the soil has been well established. It was, therefore, thought that the leaves which are shed regularly into the soil after the plant has become two months old, may play their role in maintaining the nitrogen balance. Experiments carried out at this Institute have shown that incorporation of jute leaves into the soil increases the total nitrogen. One gramme of jute leaves has been found to fix any quantity upto 40 mg. of nitrogen. Total dry weight of leaves produced by a plant may be anything from 6 to 30 grm. depending on the size of the plant and the variety. Under certain field conditions, such as mentioned below, however, there may be no fixation of nitrogen at all:

(1) Moisture condition may not be optimum, i.e. it may be too little or too much
(2) There may not be thorough incorporation of the leaves into the soil
(3) Quick oxidation due to leaves falling of on the surface only
(4) Removal of the leaves by wind, etc.
(5) Insects eating away the leaves
(6) Leaves when fall become so dry and mature that in the absence of sufficient moisture in the soil, they may not decompose at all

That leaves are the main agency which maintains soil fertility in case of jute lands is also indirectly proved by another piece of work carried out at this Institute. It has been found in a field trial where ammonium sulphate, compost, and superphosphate were added from very small to very high doses in different plots, that there has been more leaf-fall in the case of plots treated with ammonium sulphate, so much so that before the harvest there was complete lodging which led to a further leaf-fall; in the plots treated with compost leaf-fall as well as lodging were less and in case of plots treated with superphosphate, the leaf-fall was minimum and there was no lodging. Mean of total per cent soil nitrogen was 0.101, 0.125, 0.081, before jute and 0.106, 0.128, 0.077 after jute for ammonium sulphate, compost and superphosphate treatments, respectively. From this it is seen that fallen leaves have maintained the soil fertility.

After the harvest the plants are usually stacked for three to four days before retting. During this time most of the leaves remaining with the plants fall. In this connection, it may be mentioned that bigger and maturer leaves fall, whilst only small, apical leaves are left on the plants. If after harvest, the plants are stacked in the field and the shed leaves are thoroughly incorporated into the soil, the soil may further be improved.

Incidentally, it may be mentioned that in Orissa dried jute leaves are used as manure in paddy lands. In some areas in the Hooghly district in West Bengal, the plants after harvest are spread

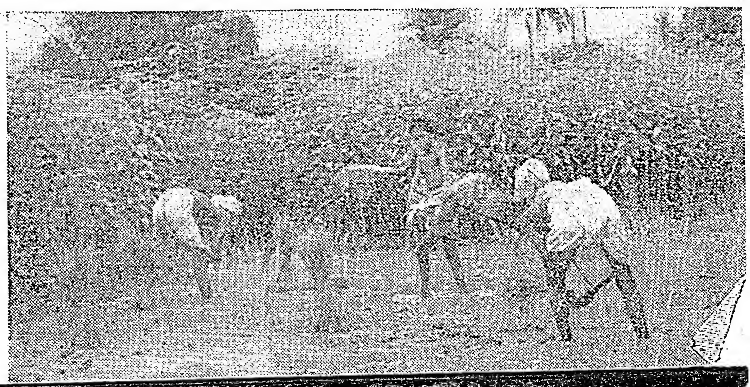
(*Continued on page 32*)

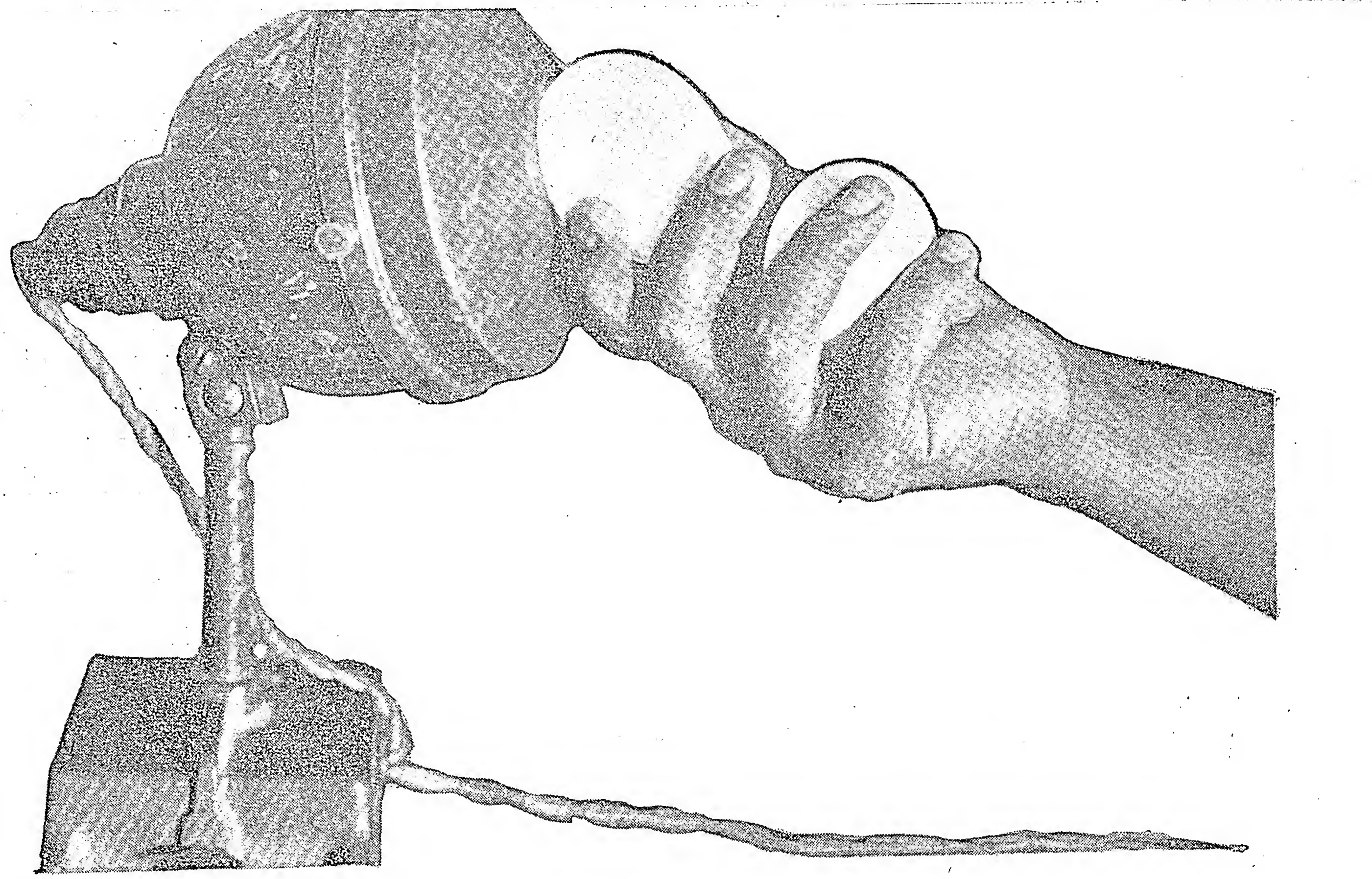
TABLE

Source	Substance	Unit	Minimum	Maximum
			Quantity of plant materials returnable to the soil	
Thinned out plants	Green plants	md./acre	15	50
Growing plants	Leaves	grm./plant	4	24
Plants at harvesting stage	Twigs and other non-fibre producing portions	md./acre	40	125
			Quantity of nitrogen returnable to the soil	
Thinned out plants	Green plants	lb./acre	20	70
Growing plants	Leaves	grm./plant	.2	1.2
Plants at harvesting stage	Twigs and other non-fibre producing portions	lb./acre	50	165

Spreading jute sticks in the fields before steeping (this practice is desirable)

Spreading jute leaves in the paddy fields





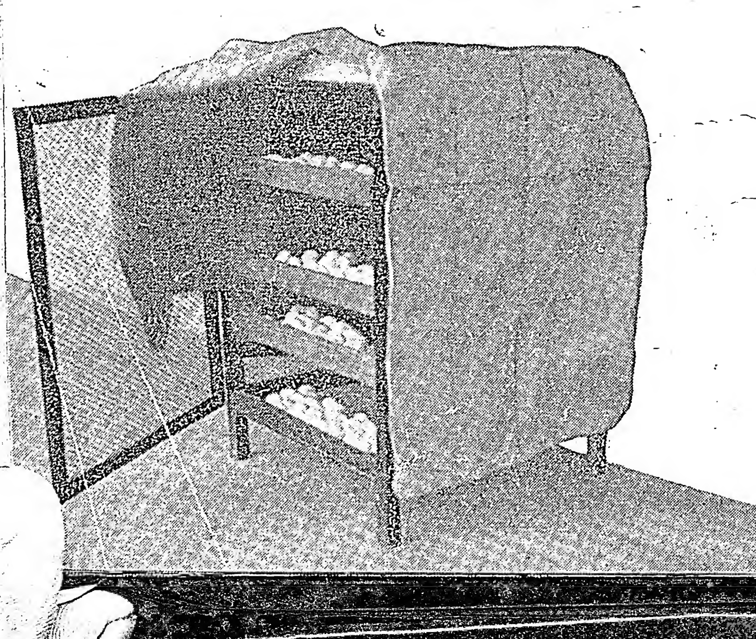
Egg candling

Eat more and

By T. S. KRISHNAN

Division of Poultry Research,
Indian Veterinary Research Institute, Izatnagar

Cooling cabinet



EGGS, though intended by nature for the propagation of the species, have been used as food by man from very ancient times. It is the egg of the domestic hen that is most widely used for this purpose by people in most parts of the world. The egg is rich in valuable proteins of high biological value, easily digestible fats of great energy content, essential minerals in readily assimilable form and important vitamins that are indispensable for the smooth and efficient performance of the various vital bodily functions. Consequently, it is admirably suited to serve as an efficient supplement to the poor and predominantly starchy diet of the average man of this country. In addition, it is a palatable food which can be served in countless ways, as a single dish or in combination with a variety of foods.

Eggs may be fertile or infertile. Generally, people are not aware that the presence of the cock is not necessary for the hen to lay eggs. The eggs laid

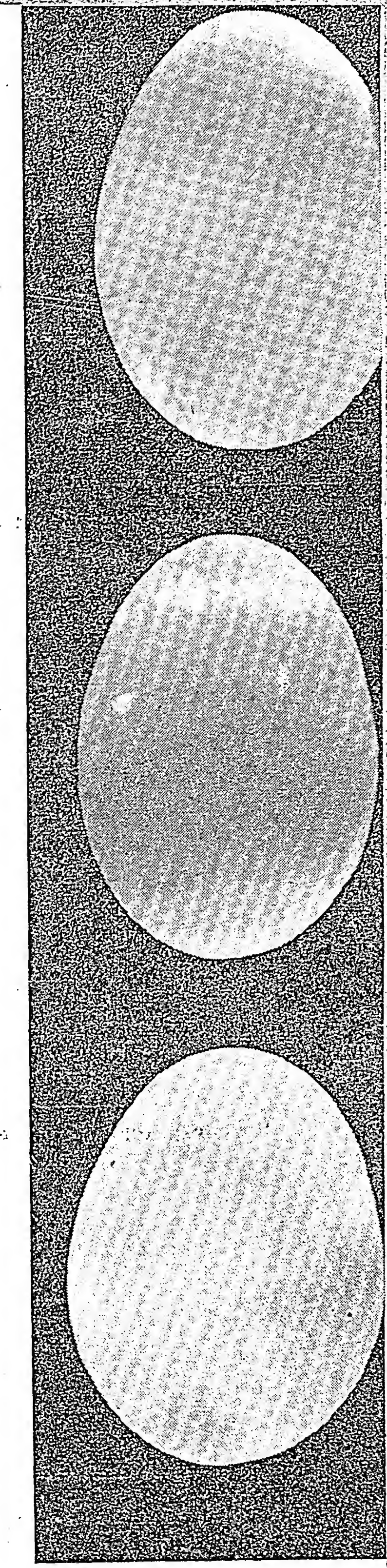
when there are no males in the flock will all be infertile, while those produced when the cocks are present in the flock would generally be fertile. Whereas both kinds of eggs can be and are used for table purposes, only fertile eggs can be used for hatching. Since the infertile ones have no life in them, not having been fertilized, they are often termed as vegetable eggs.

TESTING QUALITY OF EGGS

As with all other foodstuffs, quality and appearance are of very great importance in the case of eggs too. Though the presence of the shell is of great help in preventing adulteration and easy contamination of the contents with extraneous material, its opacity stands in the way of the ready appraisal of the true internal condition of the egg. Consequently, poor and inedible eggs are often passed off as good ones to the customers.

In the proper marketing of eggs they are tested and graded for their interior quality by what is called 'candling'. This is the term applied to the examination of the egg in front of a strong light, called the 'candling lamp', preferably in a darkened room. The modern candling lamp is often an electric light enclosed in a metal cover, provided with an internal reflector at the back and a small hole in front, through which the concentrated light issues. When an egg is held in front of this hole, some of the light penetrates into the interior of the egg, as the shell is translucent, and gives a view of the interior. By twisting the egg sharply, its contents are made to rotate, enabling a better view of the same.

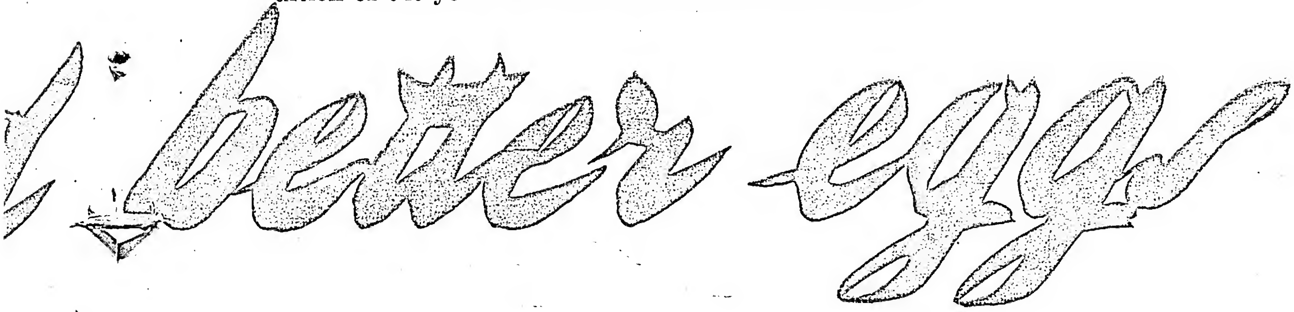
Candling gives a picture of the quality and condition of the yolk and white as well as of the amount

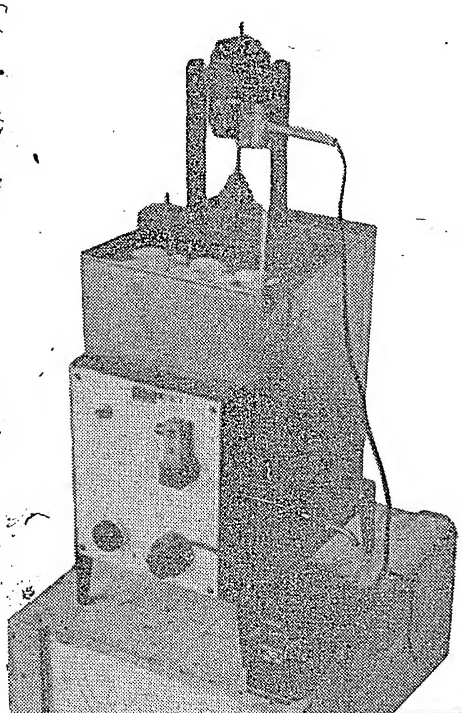


Fresh egg
(Candling appearance)

Stale egg
(Candling appearance)

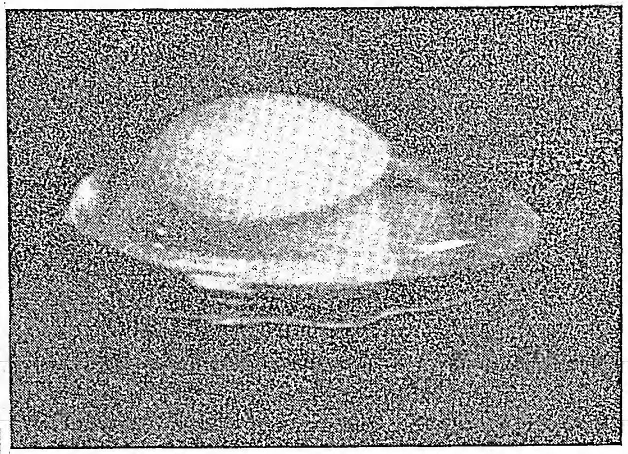
Developed embryo
(Candling appearance)



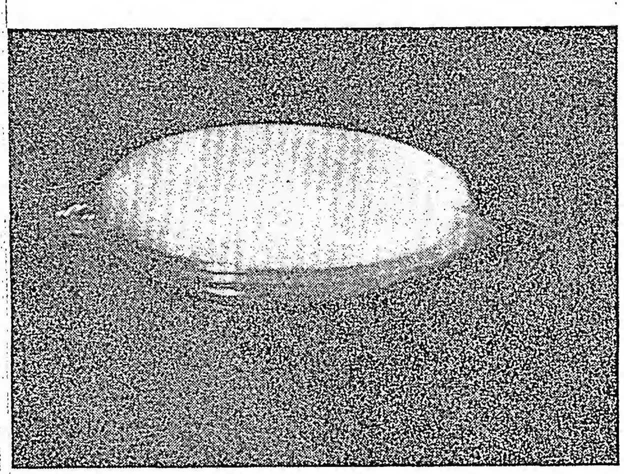


Defertilization
apparatus

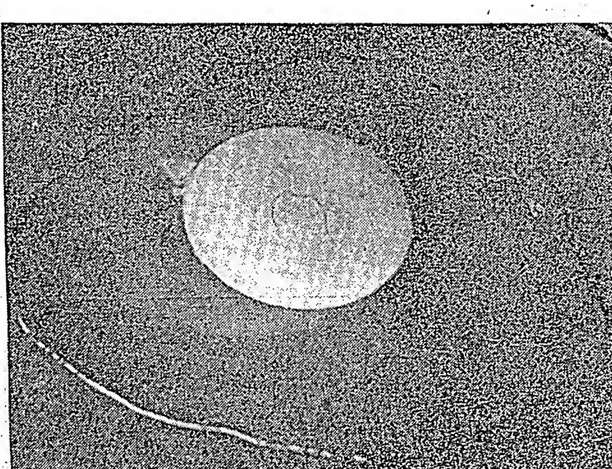
of shrinkage. It also enables the detection of shell defects like hair cracks, internal blemishes like embryo development, foreign bodies like meat or blood, or other faults like mould, rot, etc. When a fine quality fresh egg is candled, the shell would be found free of cracks, the air cell small and round, the yolk central, casting a pale shadow with a hazy outline, and the white, firm and clear. When such an egg is broken up on a plate, the yolk would be of uniform colour,



Fresh egg (opened out appearance)



Stale egg (opened out appearance)



Developed embryo (opened out appearance)

standing up well-rounded in the centre of a compact layer of firm albumen of good height and smooth, oval outline. It would also be free of internal blemishes, foreign bodies, or evidence of spoilage, as also of objectionable flavours and odours. A stale egg, however, being of poor quality, would show, on candling, a big air cell and a large and sided yolk casting a dark shadow with a well defined outline. The movement of the yolk would be either rapid or sluggish and straggling. On breaking up such an egg, the yolk would be well flattened out or ruptured, and the white, widely spread out and watery.

HOW QUALITY GOES DOWN

Most eggs are of excellent quality when freshly laid but the quality begins to deteriorate soon after that. The rate of deterioration is determined by the handling and storage conditions. Of the several factors influencing egg quality, temperature is the most important; high temperature accelerating and low temperature retarding the rate of deterioration. High temperature causes flattening of the yolk, liquefaction of the white and enlargement of the air cell. If the egg is fertile, the embryo also begins to develop. All these undesirable effects can either be stopped or greatly minimised by holding the eggs at a sufficiently low temperature. As with many other perishable foodstuffs, storage of eggs at low temperature delays deterioration, conserves quality and reduces losses.

STORAGE OF EGGS

Low temperature is the most important single factor in the successful storage of eggs. Without maintaining a sufficiently low temperature in the surroundings of the eggs, the quality of the eggs cannot be maintained at a high level with any other method even for a short period of a few weeks or days. For short periods of holding, as in the case of hatching eggs, the temperature is usually maintained around 50°—60°F., but in the commercial storage of table eggs over several months, the temperature is generally reduced to about 30°F. At such low levels changes due to enzymic, microbic, physico-chemical and other causes are reduced to the minimum. Such low temperature storage is the usual practice current in Europe and America, for the storage of the surplus of the spring egg production which is marketed in late autumn and winter seasons.

CONDITIONS IN INDIA

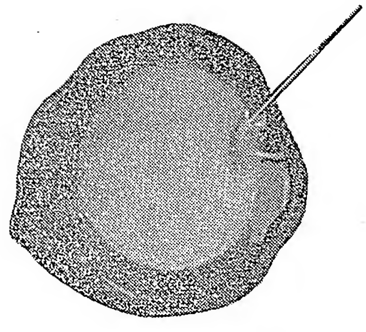
The problem facing most of the producers and traders in this country at present, is the control of tremendous losses suffered by them during the hot weather, mostly due to embryo development. This loss usually ensues within the few days required to transfer the eggs from the rural areas, where they are produced, to the urban population of the towns and cities, who form the bulk of the consumers.

The chief cause of this huge loss can be traced to the unsatisfactory and primitive methods of production and marketing prevalent here. The vastly preponderating proportion of the eggs is produced by individual farmers in the lakhs of villages in the country, each producing just a few eggs daily. All

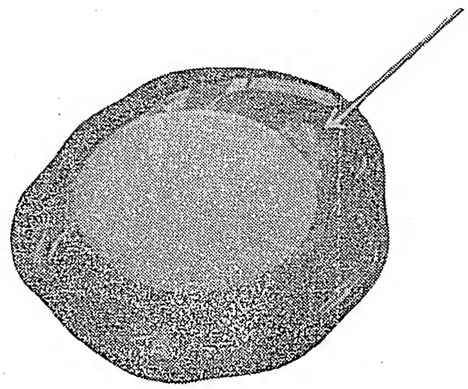
the eggs are usually fertile, since the males are always present in the flock. Generally, the summer temperature in the plains of most States of the Union is around incubation requirements, but the collection, packing and transportation operations are extremely crude and slow and all the handling is done under ordinary atmospheric conditions. In the bazaars, eggs can usually be seen displayed in the open, irrespective of weather conditions, sometimes the sun falling directly on them. Consequently, embryonic development proceeds apace and large numbers are rendered inedible in a few days, usually less than a week. The obvious remedy for preventing this loss would be to produce only infertile eggs, as the latter remain edible for a much longer time than fertile ones under similar conditions. Another way would be to keep the eggs cool by storing them in a refrigerator, or ice-box, or by other similar devices, transport them quickly to the markets and sell them to the consumers immediately, taking care that the eggs are not exposed to high temperatures in this period. These things, however, are not practicable under present conditions of production and marketing due to a variety of handicaps, such as poverty, ignorance, prejudice, disorganization, etc. with which the people engaged in this industry are faced.

USE OF LIME-WATER

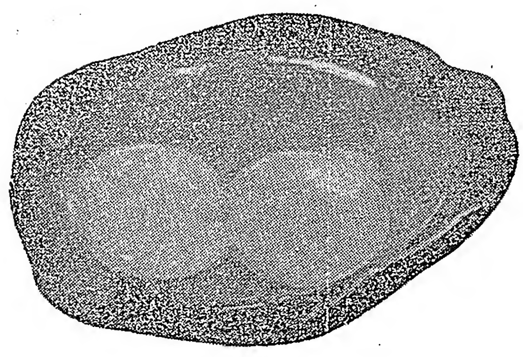
The villagers and others engaged in the egg trade employ a variety of indigenous materials like green *neem* or *shisham* leaves, bran, charcoal, ash, sand, paddy husk, salt, etc. to preserve the eggs till they are sold out. Controlled experiments carried out by the Division of Poultry Research, Indian Veterinary Research Institute, Izatnagar, have shown that they are practically valueless and in some cases even definitely harmful. Among the various materials investigated at the above Institute, lime alone has been found to give satisfactory results. The simplest and most efficient way of using it is as lime-water. Lime water is prepared by mixing freshly slaked lime with plenty of water and diluting it to the consistency of thin white-wash, stirring it frequently for two to three days, and decanting off the thin milk of lime suspension, which is used as the preserving liquid. Eggs are kept completely immersed in this liquid in glazed earthenware or similar containers. The excess lime in suspension, which settles to the bottom on standing, serves to keep up the strength of the preserving solution lost during storage and handling. Water lost by evaporation from the preserving solution is replaced regularly so that all the eggs are always completely sugmerged in the lime-water. The period for which eggs stored in this manner would remain in good condition would depend on the temperature of storage and the nature of the eggs. In northern India, if the storage is done during winter the eggs, whether fertile or infertile, would remain in good edible condition for about four months. If, however, they were stored during the summer they would keep fairly well for about four to six weeks, if infertile. Fertile eggs, even when preserved as above during this period, would go bad in about a couple of weeks, depending on the intensity of the heat.



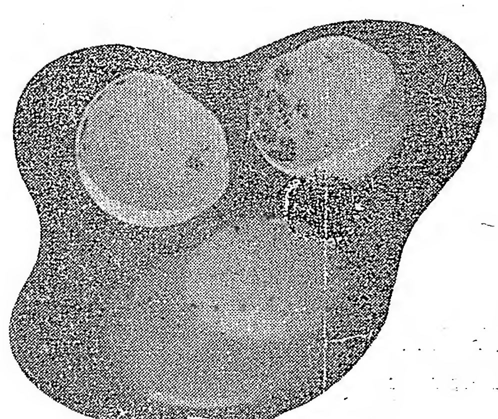
Blood spot



Meat spot



Double yolk



Mould

When eggs have to be transported to another place, the liquid lime-water, would be a handicap. However, eggs can be removed from the preserving liquid, sent to the desired place, and replaced in a similar medium, if intended to be kept for a further period.

It has also been found that the shell-pores could be sealed with lime by soaking the eggs in lime-water for a day. This treatment serves to improve their keeping quality by reducing the rate of shrinkage.

ICE-LESS EGG-COOLER

A very simple and cheap device, to serve as an ice-less egg-cooler, has been tried at the above Institute and found to be quite useful in delaying the onset of embryonic development in fertile eggs during the extremely hot, dry summer months. The cooling cabinet is constructed more or less on the model of a home-type meat safe, with wire netting on sides and bottom, and is fitted with wire-netting shelves for keeping the eggs. On top of the cooler a tray of water is kept and wetted hessian cloth is suspended on all sides with the upper end dipping in the water in the tray. The cabinet is then kept in a cool, shady verandah or other similar place where there is a free current of air. Due to spontaneous evaporation of water from the hessian cloth a marked drop in temperature inside the cabinet ensues. Fertile eggs stored in such a cooler, during the hot, dry months of May and June, have been found to show no germ development and remained in good edible condition for about 10 days, while similar eggs kept outside, at the same time, became spoiled within about four days, showing blood in the embryo. The employment of this cooler requires no great expenditure or high technical skill; all the attention it needs being to keep the water in the tray replenished to prevent its drying off.

DEFERTILIZATION OF EGGS

During the monsoon period, the humidity being high, the cooler described above, is not very effective, and losses due to embryo development continue unabated. To meet this contingency, a method has been evolved whereby the fertility in the eggs, which is the cause of such rapid spoilage, is destroyed and they are rendered as good as infertile ones. Eggs thus defertilized have been found to be fully equal, if not slightly superior, to naturally infertile eggs. The process is very simple—merely heating the eggs in water maintained at 55° C. for 15 minutes. It could be carried out by any one with average skill and at little expense. The adoption of this method on a wide scale, particularly at the primary points of large scale assembly, would lead to the complete prevention of losses from embryonic development, as the eggs do not develop an embryo after having been treated in the above manner. This would result in the saving of lakhs of eggs every year. This method was successfully employed by the Uttar Pradesh Government during the last war, in the supply of eggs to the Defence Services.

In order to further improve the keeping quality of the defertilized eggs, they may be stored in the cooling cabinet, if the period is only a few days, or

(*contd. on page 30*)

CASTRATION IN LIVESTOCK

By S. P. BERI, Animal Husbandry Deptt., Ajmer

CASTRATION of animals is very important for breeders who wish to improve their livestock, as by employing this method they can hope to obtain good results by the use of selected sires and judicious mating of males and females. It is useful in the case of those animals which are used for work, for it renders them more tractable and makes it possible to keep them in company with females and other males of the same species both at work and at rest. Male animals whose flesh is used for human consumption (cattle, sheep and pigs) are generally castrated in most of the Western countries, as they develop better, fatten more quickly and their flesh is less coarse. The operation is also performed in male fowls for production of more tender flesh and increased bodyweight. According to Reynolds, in the case of sheep, the wool produced by the castrated male is considered to be of finer quality. Castration is also used for the removal of certain diseased conditions and accidental injuries to the testicles.

AGE AND SEASON FOR CASTRATION

The best age and season for castration are much debated questions. However, the following information may be useful for different animals:

Horse: The males of this species should be castrated between the age of one to two years. It is advisable to perform the operation during mild season avoiding acute cold and heat and rains. One reason for not performing the operation during and soon after the rains is the presence of too many flies which may cause contamination of the surgical wounds.

Cattle: Opinions differ greatly regarding the best age for castration in bulls. In fact not much data based upon controlled experiments is available on the subject. According to certain authors, the bovine species should be castrated at an early age, say from two to eight months. Stock-owners in India are generally of the opinion that the bulls should be castrated at the age of about two years to enable them to attain better physical development. There is no particular season of the year specially favourable for the operation.

Sheep and goats: Males of these species are castrated when about two months of age. The period of the year at which these animals are operated upon is dependent on the time at which they are born, choosing days with a little promising weather.

Boar: The young male pig is castrated when from five to eight weeks old. The best time is a week or so before it is weaned.

Buffalo-bull: Very little is known about the effects of castration in these animals. It was pointed out in the meeting of the Board of Agriculture and Animal Husbandry in India held at Poona in March, 1953, "that the Punjab breeders did not favour the idea of castration in buffalo-bulls as they felt that the animal after castration simply withered away in vigour".

Fowl: The best results are obtained by performing this operation just before the combs are formed, or as early as it is possible to distinguish between the sexes easily from the external characters.

METHOD OF CASTRATION

It is beyond the scope of this note to give operative procedure for castration in different animals, which requires a lot of technical knowledge and can only be understood and practised by qualified veterinarians. There are numerous methods of performing this operation, which vary somewhat in different species.

One method used by the quacks in the villages of our country is still in vogue at some places. This consists in the destruction of the testicles or the vessels leading to them or both by hammering them between two hard objects like wood, until they are crushed. This method is popularly known as 'mulling'. This hammering operation generally takes a long time, which is barbarous, as it inflicts much suffering and pain on the subject.

A veterinary assistant surgeon performs the operation of castration by several methods, one of which consists in removing the testicles surgically and which is usually adopted in the case of horses. In the case of cattle, the operation is performed in a bloodless manner by not removing the testicles. The operator uses a large instrument resembling a pair of pincers, which is called Burdizzo's Emasculator. The vessels (spermatic cord) leading to the testicles are interposed between the jaws of the instrument and are pressed for about a minute, which is sufficient to crush the cord of the testicles and sterilise the animal. The instrument is constructed in such a way that with a small force applied at ~~the~~ handles, a great pressure is exerted at the pressing jaws. The testicles may get slightly swollen for about a couple of days after the operation, but the animal exhibits no inconvenience. No after-treatment is necessary. The castrated animal can be sent back to the herd immediately. In the case of sheep a smaller Burdizzo's Emasculator is used in exactly the same manner as described above for cattle.

ADVANTAGES OF BURDIZZO METHOD

The main advantages may be briefly enumerated as follows:

(a) Crushing by the quacks takes a longer time, while the Burdizzo method takes only a couple of minutes.

(b) The amount of pain caused to the animal by the barbarous method of crushing is too much as compared to only slight pain with the Burdizzo method. As the time taken for the operation is very short, no anaesthtic is required. If the owner is very keen to get the operation done under anaesthesia, the veterinarian can even do that causing absolutely no pain to the animal.

(c) The after-effect of crushing will often last for weeks and an abscess frequently forms at the seat of operation. There are practically no after-effects in the case of Burdizzo method except a slight swelling which disappears in a couple of days.

MANUFACTURE AND PRESERVATION OF SEMI-DRIED PRAWNS

By
R. VENKATARAMAN and A. SREENIVASAN
Fisheries Technological Station, Kozhikode

PRAWNS are one of the six commercially important fisheries of the West Coast of Madras State. Besides this large quantities are also fished in back-waters of Pulicat lake and in the fresh water Collair area. Good prawn fishery also exists on the East Coast in the Muthupet Swamp near Pt. Calimere. Very large quantities of the catches are simply strewn on the sand to dry. This crude method is known as beach-drying. Slightly better methods are prevalent in the Circars where the prawns are smoked, or boiled and dried. The dried prawns are packed in gunnies and beaten by clubs to remove the shell and the 'prawn pulp' so obtained is widely exported, especially to Burma.

The semi-drying technique was evolved and perfected by the Madras Fisheries Department. As the very name indicates, the product is not completely dried, but dried partially giving a pulp which retains all the qualities of fresh prawns.

There are four unit processes in the manufacture of semi-dried prawns, viz. (1) blanching (2) shelling (3) brining and (4) drying.

BLANCHING

To begin with the prawns are freed from accompanying weeds, fish fry, gastropod shells, etc. and weighed and washed in water to remove adhering dirt. They are then 'blanched'. They are dropped into a boiling solution of four to six per cent salt (four to six pounds salt per 10 gallons of water) in a tinned copper vat. The blanching lasts for two to three minutes, i.e. till the prawns float and become pink in colour. Blanching results in the inactivation of digestive juices (autolytic enzymes), in making the tissue easily penetrable to salt and in developing the pink colour. It was found that by blanching, 98.42 per cent of the bacteria originally present in prawns were killed and that the moisture was reduced by 11.0 per cent. This explains the importance of blanching.

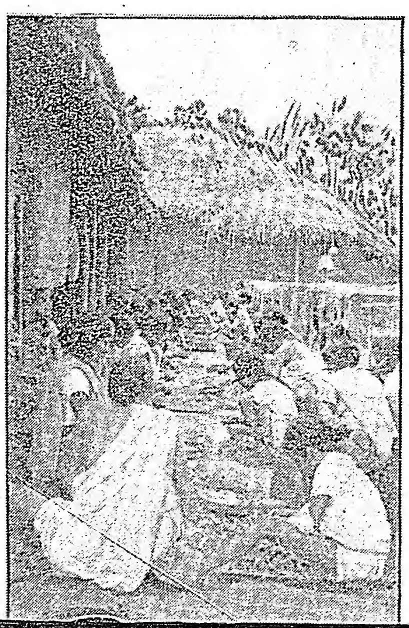
SHELLING

The blanched prawns are removed from the vat by baskets, excess brine drained and the prawns spread on mats for drying. Shelling is done by hand—the head being removed first, followed by the shell round the body and finally the tail being squeezed out from the meat.

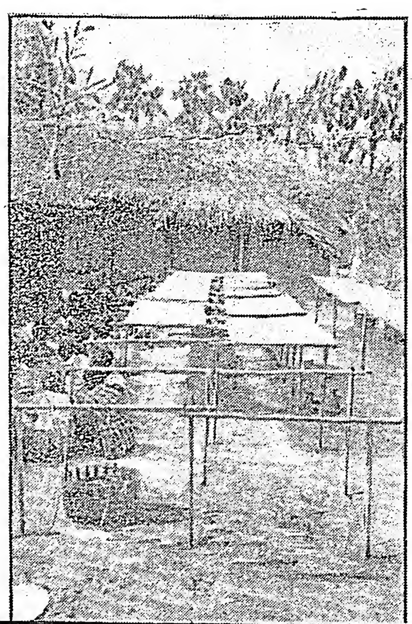
BRINING

The pulp (the resultant product after removal of shell) is collected in baskets and dipped in saturated salt solution-25° Bé (theoretically three pounds salt per gallon of water, but in practice four pounds per gallon has to be used to allow for impurities, etc.). Brining is done in enamelware, but as an alternative, wooden tubs may be used, though these are less hygienic. Fifteen minutes may be allowed normally for brining but if prawns are of large size a few more minutes, upto 20 minutes may be allowed. After brining, the meat is removed in bamboo baskets and drained of excess brine. Brining is an important process since this accounts for a reduction of 99.45 per cent of bacteria originally present and 17.30 per cent of moisture. Salt penetration is 9.64 per cent. By reducing the moisture and increasing the salt content spoilage is retarded.

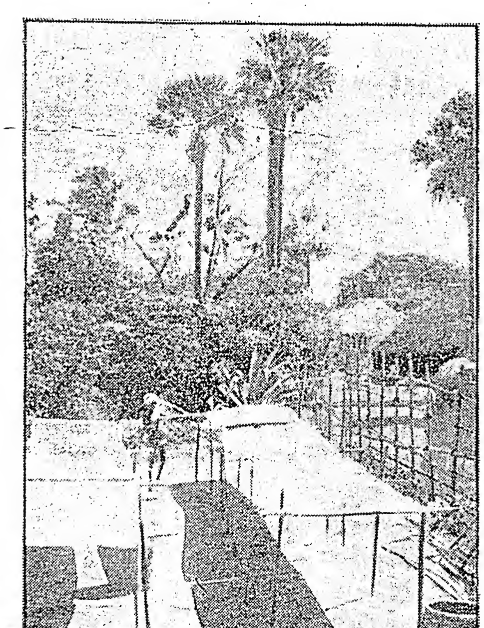
Shelling of prawns



Bamboo "thatties" on scaffolds for drying prawns



"Thatties" on scaffolds for drying prawns



DRYING

Solar heat is cheapest for drying the prawns. The brined prawn meat is spread on bamboo *thatties* erected on wooden scaffolds. Drying trays made from palmyra leaf fibre from Tuticorin were more efficient in that cutting up of prawn meat into bits which occurred while overturning in sharp bamboo *thatties*, did not occur in this smooth fibre. For a humidity of 76 to 82 per cent and a temperature range of 78° to 90°F about six to seven hours drying is sufficient. The drying is deemed to be complete, when the prawns have a 'rubber like' feeling with fine lozenge-pink colour. During inclement weather 'artificial drier' has to be used.

STORAGE

The semi-dried prawns prepared as above can keep well for two to three months in bamboo baskets lined with butter paper and stored in a cool, dry place. Butter paper and cellophane could be used for packets, but of late 'alkathene', an Imperial Chemical Industries polyvenyl plastic, has been very widely used. It can be heat-sealed and prevents dehydration and vermin attack. Semi-dried prawns sealed in 'alkathene' packets keep well for several weeks, and at low temperatures for several months.

Carbon dioxide packing of semi-dried prawns on a commercial scale was successfully carried out at Tanur Experimental Station and later at Akividu in Collair area. Laboratory experiments proved that semi-dried prawns packed in tins with sodagas and sealed keep in good condition for eight months or more.

NUTRITIVE VALUE

As a result of semi-drying, the nutritive value was not at all impaired. The product is rich in proteins, phosphorus, calcium and iron. It is equal to, if not better than, other flesh foods in nutritive value, and for the same protein value is cheaper.

DIRECTIONS FOR USE

The semi-dried prawns must be soaked in warm water for 10 to 15 minutes to remove excess salt, and then may be fried in *ghee* or oil with condiments or in any

(*Contd. on page 26*)

Culling A MEANS FOR IMPROVEMENT OF SHEEP

By
B. B. BUCH and S. JAYARAMAN

SELECTIVE breeding and hence culling or elimination of inferior stock is the first step towards the improvement of livestock. A sheep breeder should always aim at enhancing the standard of production of the flock although this is not so quickly or easily accomplished. However, definite and marked improvement can be effected in the course of some years if the breeder is determined to do it.

Before thinking of culling, it is necessary to follow certain set principles of systematic breeding. In India, it is a common practice among flock-owners to breed their flocks all the year round. This practice is defective. Along with other advantages, fixing up of the breeding season is very helpful in facilitating a culling programme. After fixing up a regular breeding season, the breeder should limit his flock to an adjusted number and the aim must always be to maintain this number among the adult stock. Every year, as each batch of female lambs reaches maturity and is to be added to the flock, the breeder can exercise his discretion in selecting the best and top ones from the flock of young ones and culling poor and uneconomic ones from the adult stock. The number of adults to be culled will naturally depend upon the number available for replacement from amongst the young stock. The stock that is to be culled is known as 'culls', while the young ones which are to replace these 'culls' to keep up the total number in the stock are known as the 'replacement stock'. Factors of economic importance like fertility, wool quality, body-size, quality and growth of lambs, fleece-weights, etc. form the basis for culling.

FERTILITY

A matter of primary importance for carrying out a culling programme satisfactorily is the number of young ones available for replacement. Obviously, when the number of fertile ewes is more, the number of young lambs available will also be more, and hence there will be possibility of culling a greater number of ewes. To secure maximum advantage, a vigilant eye should be kept on irregular breeders and under no circumstances such ewes that lamb every alternate year or every two years should be retained. They must be culled as soon as they are spotted. This is probably an inherited character for which it demands a very careful attention. The progeny of such irregular breeders should also be culled so that this character is eliminated from the flock altogether in due course.

QUALITY AND GROWTH OF LAMBS

The object of culling will be served only if the yearling ewes for replacement are quite upto the standard for breeding, wool quality, fleece-weights and such other characters of economic importance. Evidently, quality and growth of the lambs become important factors for consideration. Usually, good, healthy and well-built sheep will give birth to healthy lambs. The condition of the lamb at birth may not be of great significance to the flock-owner as its condition after the weaning age and when it reaches maturity. To obtain healthy and sturdy lambs and maintain their good condition till weaning, the ewes must be good milkers and should be able to supply adequate nutrition to the young lambs till that time. For quality of mutton, heavy lambs with fleshy constitution should be selected and the rest culled. If ewes with heavy body conformation are kept, the mutton production can be increased because the lambs produced by such ewes are likely to be of good body conformation. Anyway, ewes with poor body conformation giving a leggy appearance should not be retained in the flock.

Old ewes in the flock are a great handicap because special care is needed in their feeding. They are not able to graze properly and digest the food because their teeth are worn out. As a result of this, they remain sickly and the productive capacity is lowered. At the time of culling, therefore, aged ewes are the first to be entered in the list of 'culls'. Sometimes, on stud farms, where the objective is to obtain the best inherent characters in the flock, old ewes may be required to be retained. Though, by themselves they may not be economical, their progeny will be highly valuable and under such conditions they may be retained till they are able to breed.

WOOL QUALITY

Indian breeds of sheep produce only carpet-type wool and none of them produces wool conforming to the standard or quality required for apparel use. The principal drawback is the presence of hair and kemp in the fleeces which lower their market value to a con-

siderable extent. Elimination of hair fibres from the fleeces is absolutely necessary if the wool is to be sold for better prices for utilization in the manufacture of clothing material. Improvement to this extent is not possible for all breeds of sheep only through selection, but regular and rigid culling practices can definitely improve the quality of the fleeces to the standard of an ideal wool. The best line of action, therefore, would be to cull those sheep which have a higher percentage of hair fibres. In course of years proportion of wool fibres can be increased if regular culling is practised. This has been experienced at the Government Livestock Farm, Hissar, where valuable results have been achieved in this direction.

Uniformity in quality and the length of wool, are of great importance from marketing point of view, and hence, deserve careful attention. These characters, though heritable, are not so quickly transmitted to the progeny. Hence, more emphasis needs to be placed on these factors at the time of culling every year.

WOOL GROWTH

The returns on the farm depend on the total production, and hence, the amount of wool produced by an individual sheep has a direct relation with the total returns. A very natural instinct will tell an intelligent farmer that ewes with low fleece-weights should be discarded. Although this is quite true, it is necessary to take into consideration whether the ewe with low yield has shown this character as a result of sickness, improper nutrition, external parasites and the like during the period of wool growth. In case these factors have not interfered during the period of wool growth, low yielders may be culled. Improvement of fleece-weights takes a longer period than other factors of economic importance because this factor is not so highly heritable like some other factors such as body-weight, staple length, etc. Maximum importance should, therefore, be given to this point particularly when the object is wool production.

QUALITY OF FLEECE

Culling on the basis of length and weight of the fleece will be very effective in increasing the yield per sheep. Culling for length of wool is easily and readily accomplished. It should be done while the wool is still on the body of the sheep and at shearing time when the sheep are carrying the maximum possible growth of wool. It can be easily accomplished as the flocks are brought in for shearing, and hence, the sheep should be brought in an hour or two earlier when they are to be shorn. When the sheep are examined for length of wool and quality, it is better to examine a particular portion on the body of the sheep. The same portion should be examined for all sheep. This will ensure culling on a uniform basis. This practice can be easily understood if one is aware of the fact that the length and quality of wool are not uniform in different regions of the same fleece. To achieve best results the fleece on the side of the rump should be examined. Along with the length, corresponding fleece-weight should also be taken into consideration. In short, while examining the sheep at the time of culling, sufficient emphasis should be placed on the proportion of wool fibres, freedom from kemp fibres and staple length. Ewes showing a good staple length, high fleece-weights and minimum proportion of hairiness are to be grouped in one lot, those coming below the desired standard being earmarked as 'culls'.

CULLING OF RAMS

The breeder should not overlook the fact that the ram also wields a very pronounced influence on the flock. The ram is actually of greater importance than the ewe as one ram will be responsible for transmitting his character to a greater number of progeny, and for this reason very rigid culling has to be practised in the case of rams. Although the general principles for culling the rams are the same as in the case of ewes, it is important to have superior rams in the flock with a better standard than in the case of ewes. As the staple length of wool in general in the offspring is the average of the parents, crossing short-wooled ewes with long wooled rams should be practised if improving the length of the staple is the aim. The elimination of kemp and hair from the fleece of the ram is of greater importance than in the case of ewes as both these charac-

ters are heritable. If no ram is available on the farm without kemp and hairiness, it is advisable to go in for a better ram from a good stud farm and purchase such rams every year according to the needs.

PROPER BREEDING

Another point of importance is the method of breeding to be employed to ensure effective culling. The usual practice of allowing any ram to serve any ewe irrespective of the consideration whether their breeding will result in a better progeny or not, is a faulty one. Mass breeding without selective mating reduces the general standard of the flock to a medium rather than a higher one. For definite and speedy improvement, it is advisable to breed long-stapled rams with long-stapled ewes for raising replacement stock. This will produce better yearlings than the average flock every year and thus the ewes of medium standard could be reduced year by year.

OTHER TIPS FOR CULLING

Culling chutes may be used to facilitate the operation while going over the sheep. It is nothing but a special device with a passage prepared so that only one sheep can pass through at a time. This passage is bifurcated at the end. One door is provided in the centre so that either of the passages can be blocked while the other one remains open automatically.

The culled ewes should be properly marked before they are mixed up in the flock. The branding paint used in marking the 'culls' should not be of a fast colour as it may give a permanent mark on the fleece thereby reducing its value.

At the time of weaning certain weak and apparently poor lambs are culled and sold out while from the rest of the young stock which are weaned, selection is made for replacement of the 'culls' in the parent flock. This minimises the expenditure on unwanted lambs as they are sold before weaning. At the time of selecting the ewe lambs which are to replace the culled ewes in the flock, it is better to keep about 10 to 20 per cent more than actually required for replacement, to guard against any mortality in the parent flock. It is also probable that some of the ewes may not develop upto the required standard for a few months after the culling has been done. Such ewes, or ewe lambs which were added to the parent flock, may be culled after four or five months from first culling. At the final culling, only the number needed for replacement should be retained.

Effective culling on the production basis will in the long run prove to be a valuable means of increasing the standard of production in any flock. Culling itself is the foundation towards building up a highly productive and almost ideal flock.

MANUFACTURE AND PRESERVATION OF SEMI-DRIED PRAWNS

(*Contd. from page 23*)

other way. These can be ground to a paste and fine cutlets can be made. The Superintendent, Fisheries Technological Station, Kozhikode, will be glad to furnish recipes on the various methods of cooking semi-dried prawns.

BY-PRODUCTS

The prawn shells, which are usually thrown away as waste, are utilized as fish-meal for feeding poultry and cattle. Prawn-shell meal though it contains less of protein than other fish-meals (42 to 45 per cent) is richer in calcium and contains a fairly high amount of phosphorous also.

CONCLUSIONS

Semi-drying is a very simple process and requires simple equipment which will be available in every home. Hence, in prawn fishing centres like Saurashtra, Cutch and Orissa this can very well form a flourishing cottage industry. The semi-dried prawns prepared by the family can be sold in weekly *shandies* and thus form a supplementary source of income to the fisherman with cheap salt and fuel and no labour charges (if the household members attend to shelling, etc.). The cost of manufacture will be very little and these cottage industry products could then compete favourably with the products turned out by large scale manufacturers.

THE PAINTED BUG, BAGRADA CRUCIFERARUM KIRK

(*Contd. from page 9*)

Early in autumn these become active again and thus the life-cycle is repeated.

CONTROL MEASURES

As in the case of many other pests of agricultural crops, *Bagrada cruciferarum* also multiplies from unobserved few to millions on account of its high prolificacy. So it is very important that the pest be controlled in the early stages when its population is small. Cultivators should take to prompt and effective control measures as soon as the bug makes its first appearance in the field to subjugate the pest. The following control measures are recommended:

1. As *Bagrada cruciferarum* is polyphagous in habit, it is very important that we should not allow any weeds or other plants to grow in the field or near the field. Clean cultivation is very important to control this pest effectively.

2. Spraying the infested crops with soap solution, one pound in six gallons of water, will kill eggs and nymphs.

3. Spraying with fish-oil-rosin-soap solution, one pound in eight gallons of water, at the rate of about 30 gallons per acre will give good results in the case of eggs, nymphs and adults.

4. Dusting with 0.1 to 0.25 per cent BHC has yielded satisfactory results in the control of the pest in the farms at the Indian Agricultural Research Institute. This should be done under expert supervision.

5. Where the eggs or nymphs hide in crevices in the field, irrigating the field with crude-oil emulsion from two to five pounds per acre, according to the degree of infestation, has yielded satisfactory results.

The pest is also to some extent kept under check by its natural enemies. Two chalcid parasites, *Liophanurus* sp. and *Typhodytes* sp. parasitise the egg-masses. The adult bug is parasitised by a tachinid fly, *Alophora* sp.

 (*Contd. from page 7*)

The yields indicated that the early and medium-maturing varieties gave a better response than the late-maturing ones. Brunker 10, the earliest of the lot, gave the highest mean yield of 348 maunds per acre compared to 316 maunds from Weston 11 which was kept as a standard. Weston 11 took about a week to ten days more than Brunker 10 to come into full bloom. The next in order was Fulgham 15 which took ten more days as compared to Weston 11. The forage yields from both the late-maturing varieties, i.e. FOSI/29 and Algerian 19, were much lower than the standard. These varieties began to bloom towards the ~~end~~ of March or early April, when it became warm ~~at Sirsa~~ and scarcity of water was felt. The fertilizers also instead of enhancing vegetative growth affected it adversely and thus caused lower yields. Under favourable conditions, i.e. a cool spring and adequate moisture, they would make very good growth and give very significant response to fertilizers also.

With the early advent of the hot season and water scarcity, it was desired to grow only early-maturing varieties which would be able to complete their growth period before it became warm and give reasonable response to the application of fertilizers even with restricted moisture.

BERSEEM

Berseem, an excellent *rabi* leguminous forage crop, has begun to be grown quite extensively in the irrigated areas of the Indo-Gangetic plain. Deep and well-drained soils, rich in lime, fairly heavy in texture, are the best suited but not essential for its satisfactory growth as it will grow on almost any soil that is able to produce a good crop of maize.

It is widely grown in rotation with such non-leguminous crops as maize, sorghums, or rice because it increases the fertility of the soils. The ease with which it is possible to get a good stand of the crop by broadcasting the seed material inoculated with berseem culture in standing water, together with the high quality of forage it produces, and the improvement in soil it brings about accounts for its very important position in the agricultural economy of the rural and suburban areas. It is in fact a cash crop in the vicinity of the towns in the Punjab. Adequate moisture supply, however, is a necessary factor for its production. It is replaced by *senji, metha* under conditions characterized by shortage and by lucerne in areas with restricted irrigation to meet shortage of green forage in dry regions.

Berseem crop makes a vigorous vegetative growth in the moderately cool season. Very severe cold and frost kill the tops and inhibit its growth.

The experiments to study the response of the crop to various fertilizer treatments were conducted at the Jullundur Agricultural Station Fodder Research Station, Sirsa. The treatments included in the tests at these places were as follows:—

1. JULLUNDUR AGRICULTURAL STATION:

(i) Ammonium sulphate 100 lb. nitrogen per acre

(*Contd. on page 32*)

Oats Weston 11

 (*Contd. from page 11*)

ACHIEVEMENTS

It is estimated that nearly 20 lakh animals used to die in India annually due to rinderpest before the vaccine and sera against this disease were used. Since 1901, there have been efforts to find out various effective agents to combat this disease. The rinderpest virus was passed through goats, rabbits, and developing chick embryo and each one of these represents a safe, sure and effective protective agent saving the lives of lakhs of cattle. The problem of mass-scale manufacture has been solved. The vaccine can be kept for long periods by the special process of freeze-drying in a highly specialised equipment, known as Centrifugal-freeze-drying equipment. It is certainly now known that rinderpest can be controlled and even eradicated provided the campaign is organised on a short-term basis and finances are available.

Next to rinderpest is haemorrhagic septicaemia in cattle which takes a heavy toll. Effective vaccines are available against this disease also.

Brucellosis or contagious abortion is a disease of great economic and public health importance. It can be effectively controlled by the use of diagnostic agents and vaccine.

Anthrax is now a controllable disease. Effective vaccine is available which gives protection against the disease for nearly nine months.

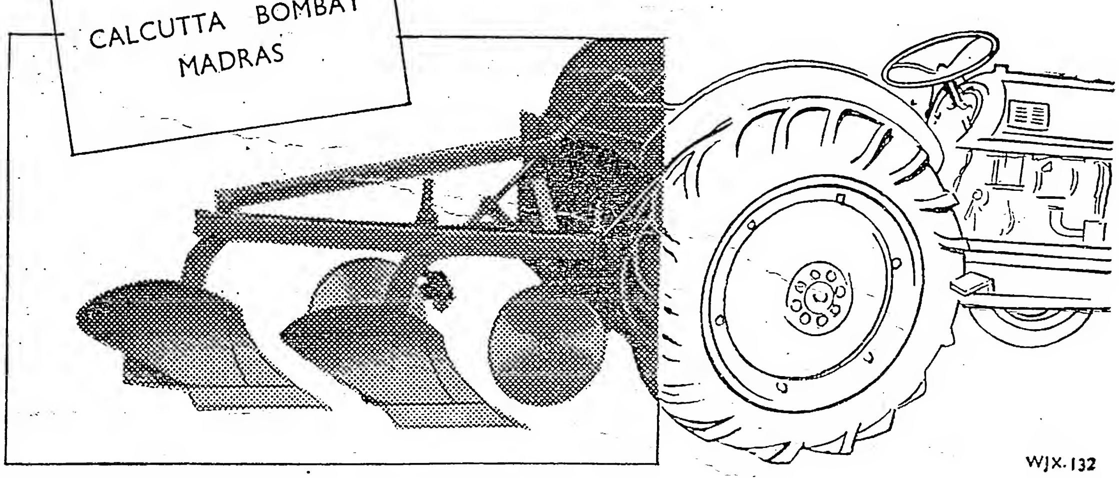
In India, poultry industry was a hazardous pursuit even a few years back due to ranikhet disease, fowl cholera, and fowl pox. Vaccines against these have been found out and standard products are now available which have gone a long way in saving the nutrition-providing industry.

DISEASE CONTROL—A PRIME NECESSITY

As described earlier, our animals have become poor in condition, stunted in size and are unproductive. Poor quality and insufficient food, trying climate and lack of proper breeding policy seem to have brought about these results. Scientists are experimenting to improve the present condition. Menwhile we must not allow our animals to die or become unthrifty due to chronic maladies. We have effective biological products which can save a poultry farm from the scourges of ranikhet disease, foul pox and fowl cholera.

Similarly, there is no reason why we should allow animals to die of rinderpest, septicaemia, black quarter or anthrax. Our efforts before launching any programme of livestock improvement should be to protect animals from these maladies.

Fortunately, there is an awakening among our people. Our villagers are very keen about keeping their livestock healthy by the use of veterinary biologicals and the demand for these products in India has increased significantly. In order to cope with this increased demand the State units are also supplying veterinary biologicals within their respective areas.



EAT MORE AND BETTER EGGS

(Contd. from page 20)

preserved in lime-water, if desired to be kept for longer periods. Keeping them in regular cold storage also lengthens their life very much. When eggs have to be sent over long distances during summer, especially when there are transport difficulties leading to delays in transit, the best method of conserving their quality and minimising deterioration would be to defertilize them, seal the shell-pores by immersing them in lime-water for a day and then despatch them to the desired destination.

In all cases it is imperative that the defertilization of the eggs be carried out as quickly as possible after they are laid in order to retain as much of the original quality as possible and get maximum benefit from the process. Once embryonic growth has commenced, or quality seriously lowered due to any cause, the defect cannot be rectified or the original quality restored, by any known means and as such the extra trouble and expense of defertilization in such cases would be useless.

The adoption and widespread employment of the comparatively cheaper and simpler methods described above, by the people in the egg trade in this country, would help reduce losses considerably, particularly in the hot weather. This would also enable more eggs to be marketed, thereby increasing the profits of the traders and contributing to the better nutrition of the people. The consumers too, would be getting more and better eggs, and perhaps cheaper too, because of low losses.

EDITOR'S PAGE

(Contd. from page 3)

adjust it to particular regions or to particular times. Then there is also the question of personnel. It is generally admitted that there is a dearth of suitably trained persons well-acquainted with the technique of information work in this country. Any undue impatience with such handicaps in hastily patching up and carrying out any programme of information service will most probably lead to disastrous results and inevitable failure because success will ultimately depend on those who are charged with its operation and working.

There cannot necessarily be any blue-prints of information work which can be forced down on the farmers of this country. Any plan of work will have to be built up preferably from below upwards so that the farmer may not feel lost in a scheme of things which has been planned from above without any consideration or sympathy for him.

EFFECT OF FERTILIZER TREATMENTS

(*Contd. from page 28*)

(ii) Ammonium phosphate 100 lb. P_2O_5 per acre

(iii) Ammonium nitrate 100 lb. nitrogen per acre

(iv) Superphosphate triple 125 lb. P_2O_5 per acre

(v) Control.

2. FODDER RESEARCH STATION, SIRSA:

(i) Ammonium sulphate 60 lb. nitrogen per acre

(ii) Superphosphate 30 lb. P_2O_5 per acre

(iii) Ammonium sulphate 60 lb. nitrogen plus superphosphate 30 lb. P_2O_5 per acre

(iv) Farmyard manure 375 md. per acre

(v) Farmyard manure 750 md. per acre

(vi) Control

Fertilizers were applied at the Jullundur Agricultural Station after the first cutting. The farmyard manure and superphosphate were applied about a month ahead of sowing and ammonium sulphate was broadcast in three equal instalments during the growing period of the crop at Sirsa.

The crop was sown at the usual sowing time by the end of September on sandy loam soil at the Jullundur Agricultural Station and loamy soil at Sirsa. It made quite satisfactory growth and was cut for forage.

The cuttings of forage were taken during the growing period as and when the crop was ready for harvesting. The crop was cut for the first time in November and subsequent cuttings were taken at intervals of about a month and a half. Early setting-in of hot season due to the failure of winter rains coupled with inadequate irrigation water invariably caused great reduction in forage production in April especially under conditions obtaining at Sirsa.

The application of fertilizers definitely enhanced forage yields at both the places, viz. Jullundur and Sirsa but differences were not significant. The berseem crop without the application of manure also gave quite good yields but in view of the special importance it occupies, any increase in yield as a result of the application of fertilizers is advantageous to the farmer. The phosphatic fertilizers as well as farmyard manure are superior to other nitrogenous fertilizers in enhancing forage yield in berseem to the extent of 27 per cent and 12 per cent and are more effective on sandy loam soils than loamy ones.

DOES JUTE CULTIVATION EXHAUST THE SOIL?

(*Contd. from page 15*)

in the field and are steeped after complete shedding of leaves. In case of jute, the non-fibre producing portion often varies from 7 to 30 per cent of the total weight of the plants, depending on the variety cultivated and the cultural and manurial practices followed. The green weight is from 1,600 kg. (3,400 lb.) to 5,000 kg. (11,000 lb.) per acre. If these are returned to the soil, the soil will be further benefited.

CONCLUSION

It has been shown that in case of jute, normally the soil nitrogen, which is exhausted during the growth of the plant is replenished by the normal leaf-fall which occurs during the growth of the plant. With careful manuring and a little care taken by way of adding the thinned out plants to the soil and the twigs and other non-fibre producing portions at the time of harvest, and stacking the plants in the fields before retting, a crop of jute is more likely to enrich the soil than impoverish it. From the table given elsewhere in this article, the possible enrichment of the soil may be seen.

INDIAN FARMING

Vol. III New Series No. 11 Feb. 1954

EDITOR'S PAGE AND EDITORIAL NOTES 2
MEN OF THE MONTH (Feature Article)—Harkirat Singh 4
THE MUSTARD APHID —E. S. Narayanan 8
NEW PADDY PRODUCTION TECHNIQUE PROVES POPULAR —A. R. Vyas 10
HAND ROTARY HOE —N. Gopalkrishna 12
AGRICULTURAL EXTENSION WORK IN THE UNITED STATES—K. S. Yawalkar and C. H. Pathak .. 13
RABIES—S. P. Beri 14
FOOD VALUE OF GHEE, VANASPATI AND OILS—N. D. Kehar .. 16
BUILDING UP A BETTER EWE FLOCK—S. Jayaraman and B. B. Buch 20
FEEDING DAIRY CATTLE —C. P. Anantakrishnan 22
AGRICULTURE IN BOMBAY STATE —V. P. Bhide 23
YAK IN THE NEPAL HIMALAYAS —G. P. Sharma 24

★

EDITORIAL BOARD

Printed and published by P. H. Raman at the Associated Advertisers and Printers Ltd., 505, Arthur Road, Tardeo, Bombay 7.
(Agents for Indian Council of Agricultural Research, New Delhi.)

ADVERTISEMENT RATES

CURRENT:
CASUAL

Full Page	.. ..	Rs. 450/-
1/2 Page	.. ..	Rs. 225/-
1/3 Page	.. ..	Rs. 150/-

CONTRACT CONCESSIONS:

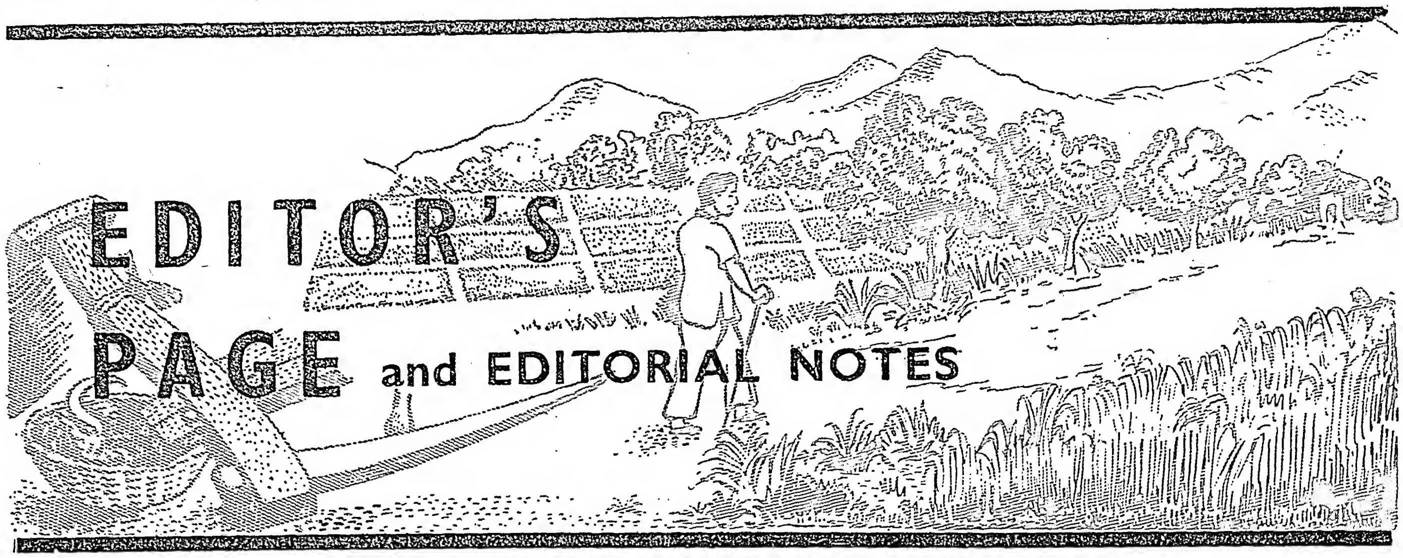
6 INSERTIONS	12 INSERTIONS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

Effective from October 1952 until further notice.

SUBSCRIPTION RATES

Annas 12 only per copy
Rs. 9-0-0 for 12 issues
Rs. 4-8-0 for 6 issues

All Business enquiries may be addressed to the "Agents" at 505, Arthur Road, Tardeo, Bombay 7.



JAPANESE METHOD—A RETROSPECT

In March 1953 the Ministry of Food and Agriculture undertook to promote a countrywide campaign for the adoption of better cultivation practices in respect of paddy crop to be grown in the *kharif* season of 1953. The main purpose of this campaign was to bring home to the farmer the essential cultural practices involved in the Japanese method of cultivation of this important foodgrain. In brief, the various steps are : preparation of a raised seed-bed, selection of the right type of seeds, lesser seed rate, line-sowing at the time of transplanting, proper interculturing, etc.

In fact the so-called Japanese method is nothing more than a sane and scientific way of cultivating paddy. There is hardly any step in this method which was not already known to the agricultural scientists in this country. What was probably lacking was an effort to impress on the farmer the benefits that he would derive by adoption of this method. To win over the farmer to follow the cultural practices comprising this method was, therefore, the problem which had to be faced.

The first prerequisite was the preparation of informative material relating to this method of cultivation and creating the proper mental climate among the farmers for the adoption of this method. The publicity material for this purpose was so planned and prepared that both the personnel connected with the promotion of this campaign as well as the farmers could understand the technique and follow the instructions given. The first campaign material was produced in English and Hindi. These were later translated into the major regional languages with such minor modifications as were found necessary to adjust the recommendations to the different agro-climatic areas of the country.

The publicity material did not consist of printed material only. The help of other audio-visual aids as well as demonstrations was taken recourse to. Such, for instance, were the film-strips, flannelgraphs which explained the story of the new method of rice cultivation and the benefit that would accrue to the farmer by its adoption in the shape of increased yield. Special efforts were made to ensure that the publicity material was brought to the notice of those for whose benefit it was made.

In addition to what has been indicated above, various other measures were adopted to induce the cultivator to take to this method of cultivation. Such, for instance, were granting short-term loans to the farmers and the reduction in price of fertilizers.

Reports from various sources indicate that the efforts made by the Central and the State Governments to introduce better paddy cultivation all over the country had met with success. This could be ensured from the statements from various sources, viz, from the individual farmers, reports of the State Governments, from data relating to fertilizers despatch and consumption, etc. From the reports it has been ascertained that a total of 2,06,175 acres in 25 different States have been put under the new method of cultivation. All the different steps pertaining to the new method of cultivation have been followed in these acres. In addition, the method has been partially adopted, particularly in the application of fertilizers, over an additional 30 lakh acres. In 23 States a total of 14,366 acres of seed-bed was reported. As compared with the acreage under the improved method, the seedling area appears to bear a very close approximation of the actual field area which could possibly be transplanted with the seedlings produced.

It will be at this stage appropriate to examine the various factors that went into making this campaign a success. The main factor was the conviction

carried to the farmer about the usefulness of the new method. This conviction was carried to his very door and he had not to grope about for facts and techniques. As a consequence, other factors became naturally operative. The farmers were initiated into the practice of using greater amount of fertilizers and manures with the result that these brought them good dividend. The use of good quality seeds was also an important step. The fact was impressed upon the cultivator that the better quality of seed would go a long way to give him a better crop. In addition to better seeds, a lower seed rate per acre was stressed. This had an advantage over the older orthodox method in which the farmer had to use larger quantity of seed. In many cases the operations were combined with certain types of improved implements which facilitated work. Lastly, the proper care of the seedlings in the nursery stage and proper interculturing and weeding of the plants in the field were of great importance. In short greater attention was given to the individual plants in this method, and the labour thus bestowed gave adequate return in the shape of greater yields.

Throughout the time the campaign was under contemplation, and later when it was actually conducted, the time factor was kept constantly in mind. By the time the decision was taken to work on the campaign, the sowing season was hardly a few months ahead, and steps had to be taken speedily enough to ensure that the instructions and the practices advocated reached the farmer well in advance of the sowing season. For this purpose, it was necessary that agreed recommendations were to be made ready before the advent of the sowing season and this was done. Then there was the question of organising the supply lines so as to ensure that all the materials required were made easily available. Thus, for instance, the availability of fertilizers, seeds, etc. was arranged for much ahead of time. In planning the campaign a dead line was drawn by which time the campaign material was proposed to be in the hands of the workers. This was necessary because if the workers were not adequately fed with literature and other visual aids, the campaign would have a lame start. This dead line was strictly adhered to and it was ensured that all the necessary campaign material was in the hands of the workers when they required it. And not of any less importance was the support of the leaders of rural areas, of village school masters, of public workers, etc. which was sought and readily given. Since it was a campaign meant for the people, it was essential that people's cooperation should be sought and ensured.

The data relating to fertilizer consumption make interesting reading. The reports indicate that for the period ending the 30th September, 1953, 2,12,754 tons of ammonium sulphate were consumed as against 1,89,172 in 1952. It should be mentioned in this connection that the data relating to 1953 cover a period

(*Contd. on page 32*)

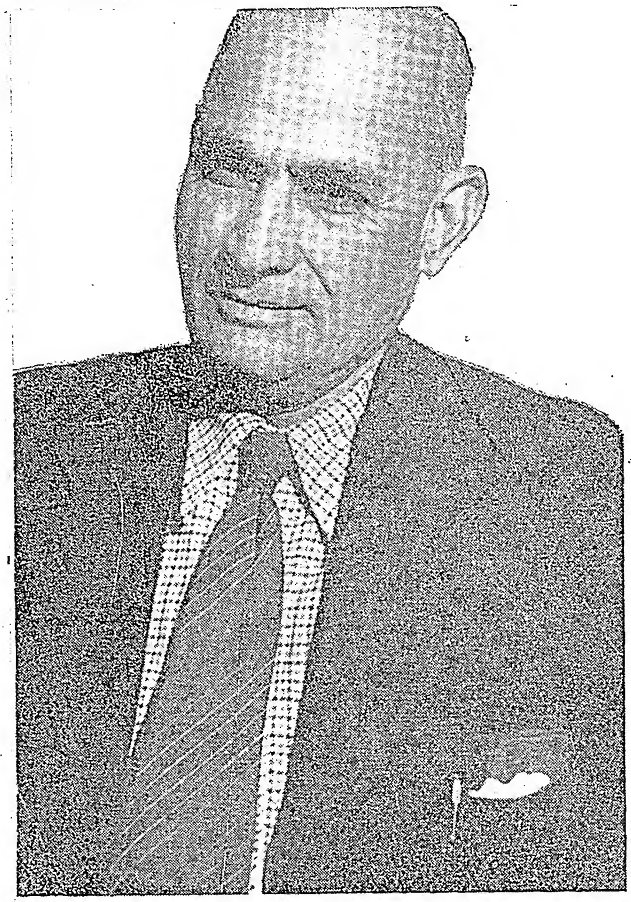
(OUR COVER)

A paddy field in Bengal—the stalks being cut for separating the grains

MEN OF THE MONTH:

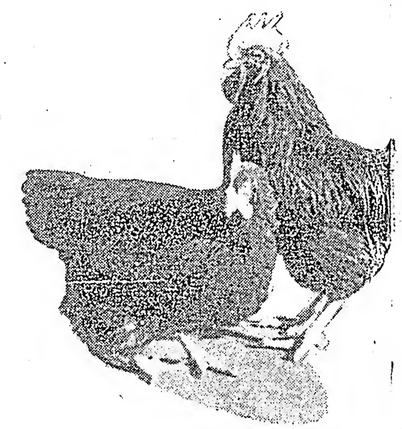
Personal Care ...

POULTRY-...



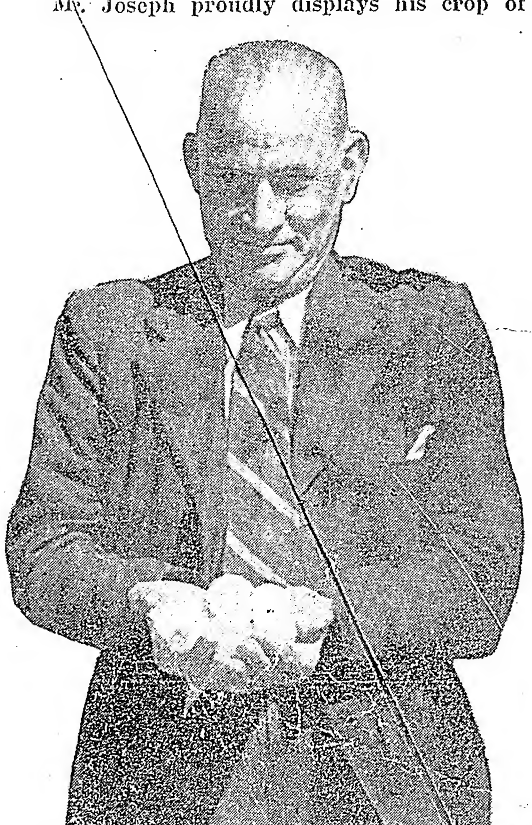
Mr. N. C. Joseph

By
HARKIRAT SINGH



This fine pair of Rhode Island Red variety has been bred by Mr. Joseph

Mr. Joseph proudly displays his crop of eggs



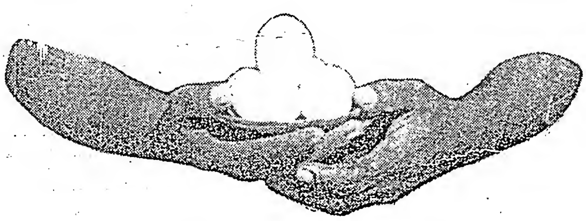
IT was an extremely pleasant experience to meet Mr. N. C. Joseph, an enlightened poultry-keeper of Ajmer. Mr. Joseph is a veteran in poultry-keeping and has developed it into an art. Poultry-keeping as a hobby would perhaps be regarded by most people as a waste of time and money, but Mr. Joseph is vehement in asserting that it is a profitable pastime, if intelligently pursued. "Besides giving certain extra-income in these days of economic stress," he added, "plenty of excellent nutritive food is ensured to the keeper and his family; even the droppings of poultry are useful as manure for kitchen gardens." The observations made by Mr. Joseph are based on experience and his talk on the subject of poultry-keeping is frequently interspersed with interesting anecdotes from his long career of over 40 years in this line.

HOW IT ALL STARTED

Mr. Joseph was initiated into poultry-keeping by his mother when he was only eight years old. She being a keen and enthusiastic poultry-keeper herself wanted Joseph to learn the secrets of this art at an early age. So she entrusted all her birds to the care of young Joseph. He did not betray the confidence placed in him by his mother and gave her a surprise

Essential in

KEEPING



A few eggs produced by hens raised by Mr. Johnson

The prize-winning Rhode Island Red belonging to Mr. Johnson

by winning a second prize in one of the local poultry shows held at Ajmer. The stimulus thus gained was sufficient and his interest in poultry gradually increased. He now cherished a dream to rear a flock of quality and class birds as his own.

The keen and healthy rivalry prevailing among the poultry-keepers of Ajmer at that time provided the necessary atmosphere for the development of Mr. Joseph's ideas. When he joined the railway department, with his first pay he went in for a set of eggs of White Orpington. Fortunately, from the chickens hatched out of this set, Joseph won a prize for the best bird at a local show, beating nearly all the imported stock in Ajmer. Thereafter, Mr. Joseph became a member of the Indian Poultry Club and started exhibiting his birds in the All-India Poultry Shows held at various places of India. "And wherever I exhibited my birds, I never let down my province and won a series of prizes," he said, with eyes radiating pride.

Johnson spreading clean sand in the spacious cages maintained by him

Before going to office Johnson ensures that his birds are well-fed for the day.

SECRET OF SUCCESS

All this, of course, was introductory to what I really wanted from Mr. Joseph. I was interested in how he managed to make capital out of this hazardous hobby. He was amused at my enquiry and jocularly remarked that he did not possess any magic wand. The only thing that he did was that he observed all the simple rules of poultry-keeping very strictly. "To devote personal attention and care to all possible extent was the best way to raise quality birds"—this was the golden rule he followed.

Mr. Joseph believes in giving the chickens a good start. For the first three months he feeds them on skim milk, cereal grains of good quality and hoppers filled with mash. To give a good exercise to the tiny birds, he places the grains under good, clean and deep litter. As soon as the sexes can be distinguished, females are picked out from the flock and kept separately. This is especially beneficial for the pullets who are thus saved bullying by the males.

Another important point that is often overlooked by an ordinary poultry-keeper is the necessity for drastic culling and the elimination of undesirables. Only the best birds should be maintained. Mr. Joseph has developed a novel way of detecting the sick and the sorry birds. Early in the morning, he would inspect his flock and see whether the tails of all the birds were up and erect. The ones with downcast tails would at once be segregated from the rest of the flock, and in case the symptoms were serious enough, these would be destroyed straightaway. Everyday the droppings of the birds should also be examined to ensure that the birds were not suffering from any internal worms.

To keep the birds healthy, their dwelling places must be kept scrupulously clean. They must be sufficiently roomy and airy and should be kept free of any kinds of worms or ticks. The corners of the cages should be disinfected at least once in a week with the simple treatment of kerosene oil and phenyle in the ratio of 50 : 50. Such simple measures have helped Joseph keep out the most deadly disease among poultry, the Ranikhet disease, all through his long career as a poultry-keeper. And this is not a negligible achievement.

Each night Mr. Joseph would visit the cages to see that the crop is full. It should also be ensured that the birds were not losing weight. In sleeping birds breathing should not be accompanied by any sound. The last feed of the day should also be considered very important. This should be adequate so that the birds might not suffer from night starvation.

GENERAL REMARKS

Mr. Joseph has kept nearly all the common breeds of poultry, but he has developed a special preference for the Rhode Island Red variety. It is his view that this breed is as hardy as the *desi* and is quite well suited to Indian conditions. Though Rhodes consume more feed than the other types, they are absolutely docile and provide excellently nutritive food both in respect of quality and quantity.

(*Contd. on page 29*)


Quick - Lathering Sunlight
washes WHITE and BRIGHT without beating
"Teacher says I'm a smart girl. That's because mother washes my frocks sparkling white with Sunlight Soap. Those heaped-up creamy Sunlight suds chase the dirt out—quickly, easily, without beating."
"I'm the brightest girl in my class. See how Sunlight washing keeps my coloured frock bright as a button! Mother says Sunlight is gentle with clothes, helps them last longer. That's something to skip about!"
SUNLIGHT SOAP
SUNLIGHT SOAP
saves clothes saves labour saves money

S. 219-X52

SEASONAL PESTS OF CROPS:

THE MUSTARD APH

By

E. S. NARAYANAN,

Head of the Division of Entomology, I. A. R. I., New Delhi

THE aphids, popularly known as the plant lice, belong to a well defined group of insects with soft bodies and piercing mouth parts with a complex and almost fascinating life-history and a staggering rate of reproduction. These aphids may be of various colours like green, grey, brown, red, black and white. They sometimes secrete long, white threads that give them a wooly appearance and lie beneath them. In other cases they secrete a sort of dust or bloom. Most of them, however, have no covering and are naked. The mustard aphid, *Rhopalosiphum pseudobrassicae* is an important member of this exclusive group and is a serious pest of this valuable oilseed crop throughout the Indian Union. They pierce the plants and suck their life-giving sap and thus devastate crops. A few years ago the mustard crops of both Uttar Pradesh and Bihar were ruined in this manner.

Though the pest is called the mustard aphid, it is a serious pest of all cruciferous crops grown in the cold weather in our country. It is, however, a major pest of mustard and rape. To the cultivators of the Punjab it is known as *tela* while in the Uttar Pradesh it is known as *maun* or *mahun*. The species is widely distributed and has been reported from almost all parts of the world. Apart from mustard and rape, its choicest food plants, it has been recorded to infest and cause appreciable damage to radish, spinach, turnip, knol-kohl, cabbage, cauliflower, lettuce and other crop plants and wild shrubs of the brassica family that grow in the cold weather. In Delhi the pest has also been recorded on tobacco and potato.

The mustard aphid is a tiny, soft-bodied insect about one-tenth of an inch long and whitish green in colour. It appears in the field sometime in November or early December depending on the weather conditions when the mustard plants have put forth their stems. Even the tender plants are sometimes literally covered with hundreds of thousands of these little villains. The affected leaves usually get curled and if the infestation is severe the plants wilt and wither. It is not unusual to find in the fields many plants in a dwarfed condition or having a stunted growth. The more heavily infested plants rot and perish. These aphids secrete a sweet liquid known as the 'honey dew' which is eagerly sought by certain species of ants that return their gratitude to their generous host by almost forming a first line of their defence. These ants sometimes even provide the aphids with adequate shelters. Apart from the ants bees, wasps and other flies are regular visitors to get their share of this sweet liquid. A black mould develops on a badly infested plant and in such cases the crop gets a black, blighted appearance.

LIFE-HISTORY OF THE PEST

Although the mustard aphid is a major pest of cruciferous crops in our country, there is still a gap in our knowledge of its complex life-history. The climatic conditions prevailing at any place at any time govern vitally the bionomics, biology and the rate of multiplication of the pest in the field. The mode of oviposition, the formation of wings in adults and the prevalence of both sexes are governed solely by the ecological factors. In temperate climate we usually get a brood just before the winter comprising of both males and females, the latter producing fertilized eggs which hibernate during the cold weather and hatch during the spring. The adults that are produced comprise both winged and wingless forms. In spring and summer, however, the aphids produce young ones without fertilization and the progeny are invariably female.

This general outline of life-history does not apply to the Indian aphids, at least those that occur in the plains. There are some forms that are active only in the winter months while others are present throughout the year if food is available. So far as the mustard aphid is concerned it makes its first appearance, as has been mentioned before, sometime in November and is observed causing extensive damage to various cruciferous crops upto April. The damage starts with mustard subsequently spreading over to radish, cabbage, knol-khol, etc. No sexual forms have so far been recorded in Delhi and the surrounding areas. Agamic or asexual production is the rule. The same has been observed in Mysore and other places in the south. It is just possible that in the hilly tracts of the Indian Union, specially in the north, where there is a severe cold weather with frost and snow, this species appears in sexual forms and lays eggs also. In the plains, however, they multiply asexually generation after generation. The first females that appear on the crop, and which are known as the stem-mothers, produce tiny living young ones which mature within a week or so and produce again other young ones. These multiply generation after generation in geometrical progression until their huge population becomes deadly to the crops.

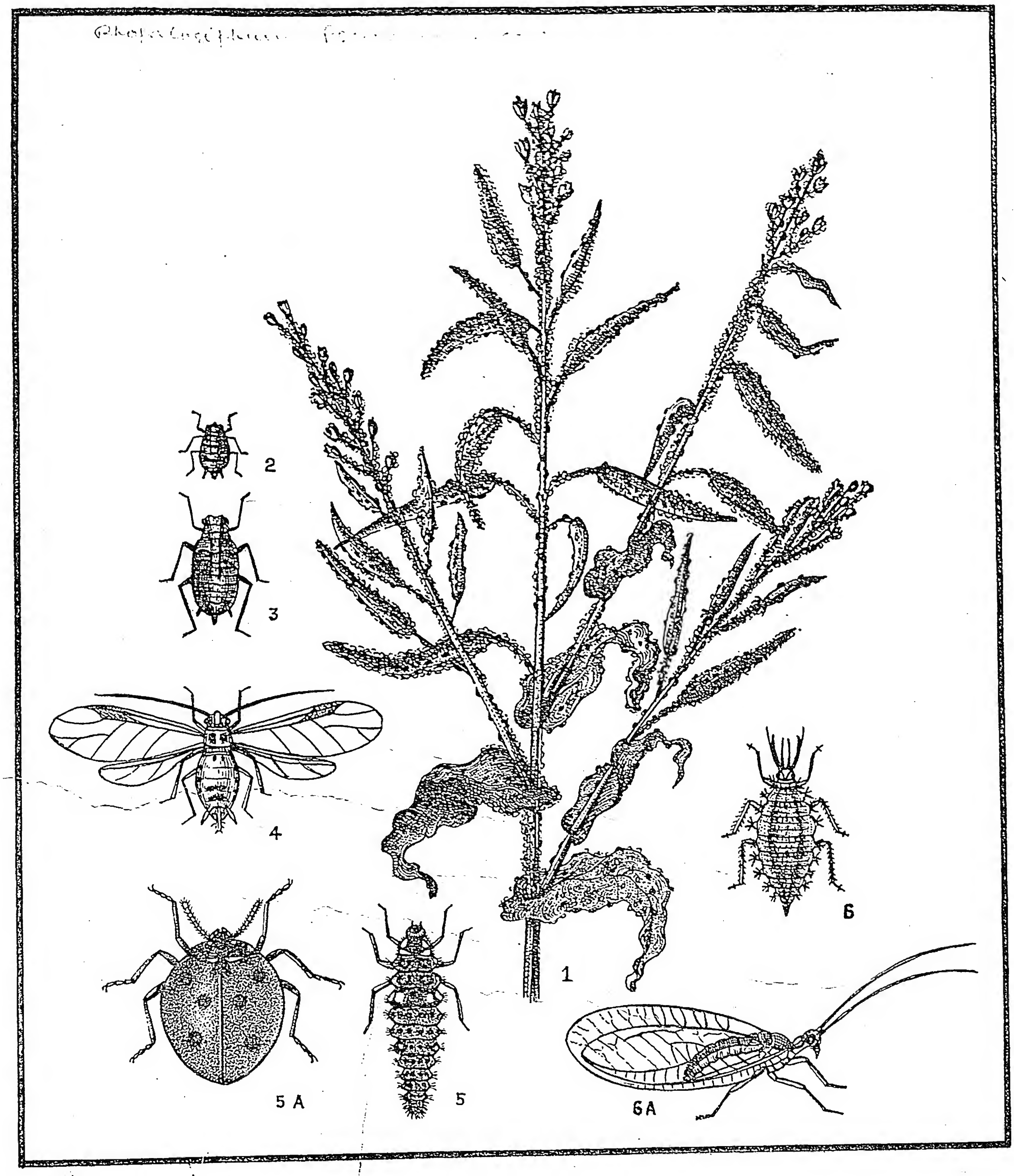
When the mustard is harvested, they turn to radish, cauliflower, cabbage or any other cruciferous crop that is left in the field. Their number goes on decreasing and as the temperature rises, the days get longer and the summer approaches, a generation of winged adults is produced that establishes small colonies on plants growing in cold moist places. Sometimes these winged adults migrate to hills

(*Contd. on page 23*)

Rhopalosiphum pseudobrassicae (DAVIS)

THE MUSTARD APHID "RHOPALOSIPHUM PSEUDOBRASSICAE" (DAVIS)

1. A mustard plant showing the infestation by the pest
2. Young nymph
3. Grown-up nymph
4. Winged adult
5 & 5A. The predator lady-bird beetle—grub and adult stages
6 & 6A. The grub and adult stages of the predator 'Chrysopa' sp.



New Paddy Production

INCREASED ACREAGE AN

Section of a field under the improved method of paddy growing

By

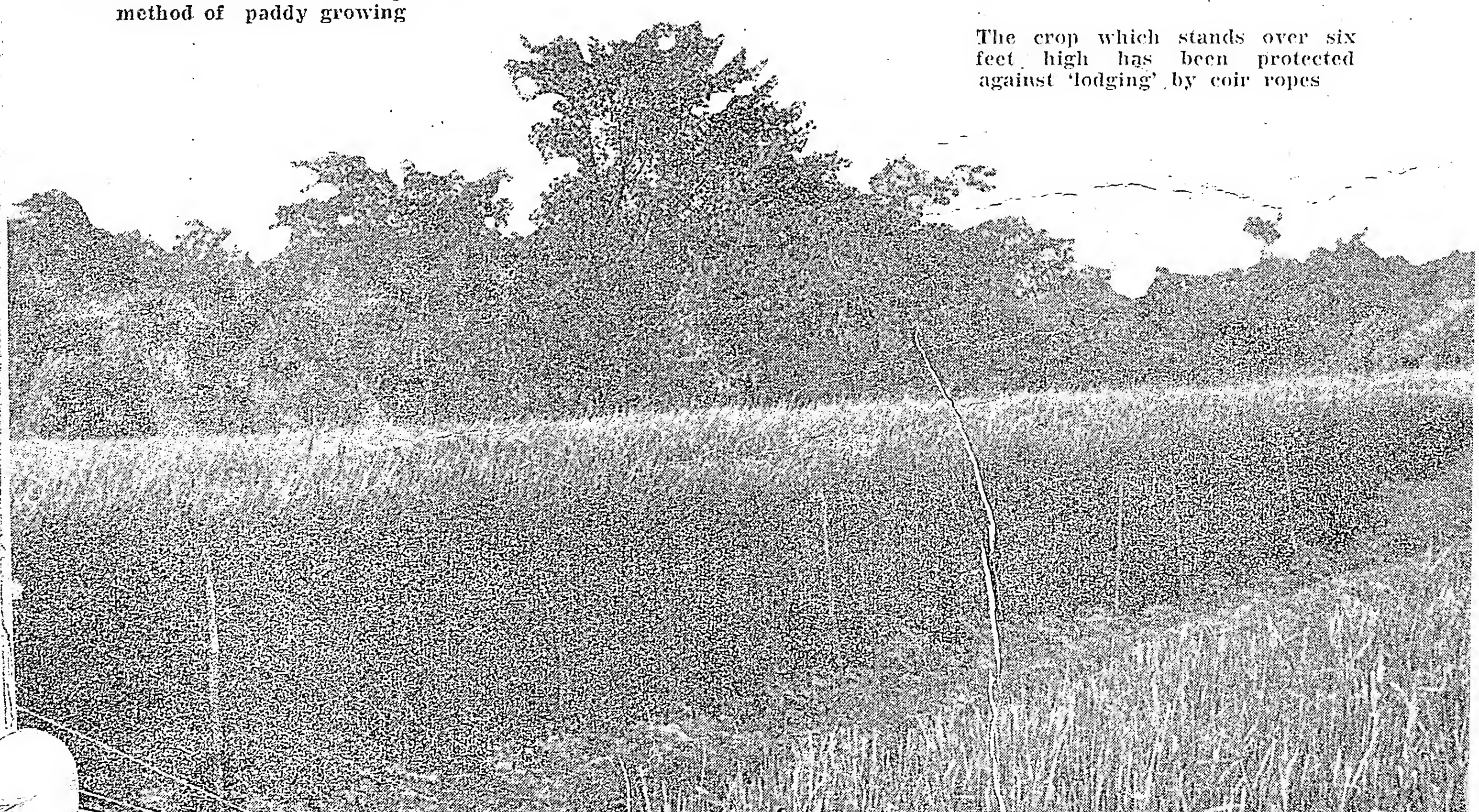
A. R. VYAS

FROM ten acres of land which were under the Japanese method of paddy cultivation, during the last *kharif* season in the Kolaba district of Bombay State, the area during the current *kharif* has increased to 400 acres; the yield on one farm which I visited last September has more than doubled. The average has increased from about 30 maunds of paddy to the acre to about 80 to 100 maunds. The wisdom of the improved method has caught the imagination of the farmers of Alibag in the Kolaba district.

METHOD PROVES POPULAR

The credit for popularizing the improved technique goes both to the major political party in the district and the agricultural officials. The first mobilized all its efforts to carry the knowledge to the fields of individual cultivators; the officers of the agricultural department provided farmers with the technical 'know-how' and fertilizers in time.

The crop which stands over six feet high has been protected against 'lodging' by coir ropes



...n Technique Proves Popular

...D YIELD IN KOLABA DISTRICT

Nearly 590 farmers have grown paddy this year under the guidance of agricultural officers, each of whom looks after 10 acres; more than 250 cultivators have started on the improved method after seeing the results on their neighbours' fields. The seed rate, I was told on good authority, has come down from 40 - 80 lb. an acre, to between 10 and 15 lb. Next season it will have dropped to 10 lb.

MHATRE'S 18 ACRES

Shri N. K. Mhatre of village Dhokowda in Alibag, Kolaba district, has grown 18 acres of paddy under the improved method. His crop which had begun flowering when I saw it, stood about six feet high. Cheek by jowl was another field which had followed the old technique. The thin crop was barely three feet high, with very few tillers. Each of Mhatre's plants had more than 40 tillers as against an average of 20.

The area gets an average rainfall of 100 in. a year. The excellent condition of the crop is, therefore, the result of heavy manuring, transplantation from the raised seed-bed and interculturing.

The seed sown was of the K42 variety and manuring was done at the rate of 64 lb. of nitrogen and 32 lb. of phosphates to the acre. This farmer is, however, experimenting with different types of manure in different plots. In one area, he has used fish-manure, in another manure of sheep droppings, and different combinations of manure in yet another plot.

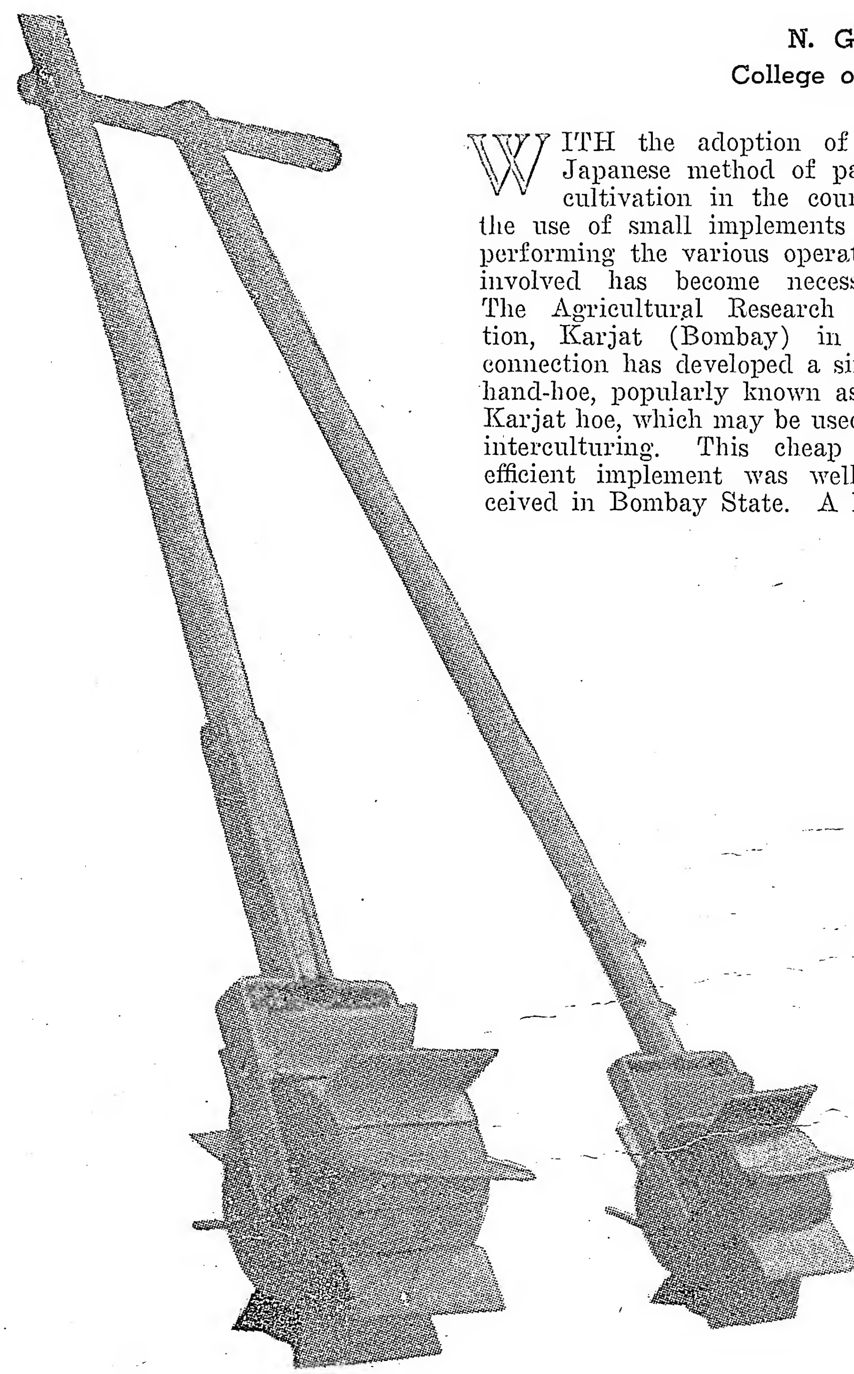
Translantation of seedlings was carried out in the first week of July and there have been four interculturings. The crop was harvested towards the end of October. The yield in one of the farms was between 80 to 100 maunds to the acre, as against less than half this quantity last year, when the old method was used.

Each plant has over 40 tillers as against the average of 20 under the old method of paddy growing

This gives an idea of the shape and healthy growth of the crop

Hand Rotary Hoe

By
N. GOPALKRISHNA,
College of Agriculture, Poona



WITH the adoption of the Japanese method of paddy cultivation in the country, the use of small implements for performing the various operations involved has become necessary. The Agricultural Research Station, Karjat (Bombay) in this connection has developed a simple hand-hoe, popularly known as the Karjat hoe, which may be used for interculturing. This cheap and efficient implement was well received in Bombay State. A large number of this type of hand hoes has since been manufactured in the workshop of the Agricultural Engineer, Bombay State, and supplied to interested persons in other States as well.

Manually-operated weeders of the Japanese type are available in the market but these are rather costly and are beyond the buying capacity of an average Indian cultivator. To overcome this disadvantage, a small manually-operated rotary hoe has recently been perfected at the Agricultural Research Station at Karjat for the benefit of the farmers. This hoe is an improvement over the Karjat hand-hoe and is also suitable for interculturing in wet paddy lands. The backward motion and the pressure required for working the Karjat hand-hoe have been eliminated in this improved type and it performs all the operations of interculturing at one stroke, viz. cutting of weeds, mixing these with slush and thoroughly aerating the soil by its rotary action. It is very economical to use, working four to five times faster than the Karjat hoe. It is simple in construction, light in weight and easy to operate even by a layman. With this hoe a worker can normally interculture $1\frac{1}{2}$ to 2 acres a day with ease and without much strain.

Enquiries regarding the Hand Rotary Hoe may please be addressed to the Agricultural Engineer to the Government of Bombay, College of Agriculture, Poona-5.

AGRICULTURAL EXTENSION WORK IN THE UNITED STATES

By

K. S. YAWALKAR and C. H. PATHAK

THE United States of America possesses an extensive, well-planned agricultural Extension service, which has remarkable work to its credit. Extension work in America is based on the partnership between the government, the land-grant colleges and the people. Its fundamental objective is to better the living standards of the people. This improvement is sought to be brought about by translating the results of scientific research into everyday practical usage to be followed by farmers, housewives or a community or by the whole village. Stated in brief form by Brunner and Smith, some concrete objectives of agricultural, home economics and 4-H Extension in the United States are:—

(1) To bring the farmer the knowledge and help that will enable him to farm still more efficiently and to increase his income,

(2) to encourage the farmer to grow his own food, set a good table, and live well,

(3) to help the members of the farm family to a large appreciation of the opportunities, the beauties, and the privileges of country life, and to know something about the world in which they live,

(4) to train youth to take his place as a member of the family, community and society,

(5) to promote the social, cultural, recreational, intellectual and spiritual life of rural people,

(6) to place opportunity before rural people whereby they may develop all their native talents through work, recreation, social life and leadership, and

(7) to build a rural citizenry, proud of its occupation, independent in its thinking, constructive in its outlook, capable, efficient, self-reliant, with a love of home and country in its heart.

Thus Extension not only takes the findings of science to the farmers and assists them in stepping up production, but it also takes the problems of the farmers to the research laboratories for investigation. Thus Extension may be thought of as a two-way channel—extending, on the one hand, the findings of science to the farm people, and, on the other, taking the problems of the farmers to the research workers for study and analysis.

The development of this programme on such a large scale is not without a philosophy.

According to O. B. Martin, there are four great principles upon which the Extension Service proceeds, namely,

(1) The citizen is the sovereign in a democracy,

(2) the home is the fundamental unit of civilization,

(3) the family is the first training group of the human race, and

(4) the average farm is endowed with great resources and possibilities.

Professor M. L. Mosher (University of Illinois) has given a five-point outline for agricultural progress:

(1) *Research*—that learns the facts on which a sound agriculture is based

(2) *Education*—of many farm people in the facts learned through research

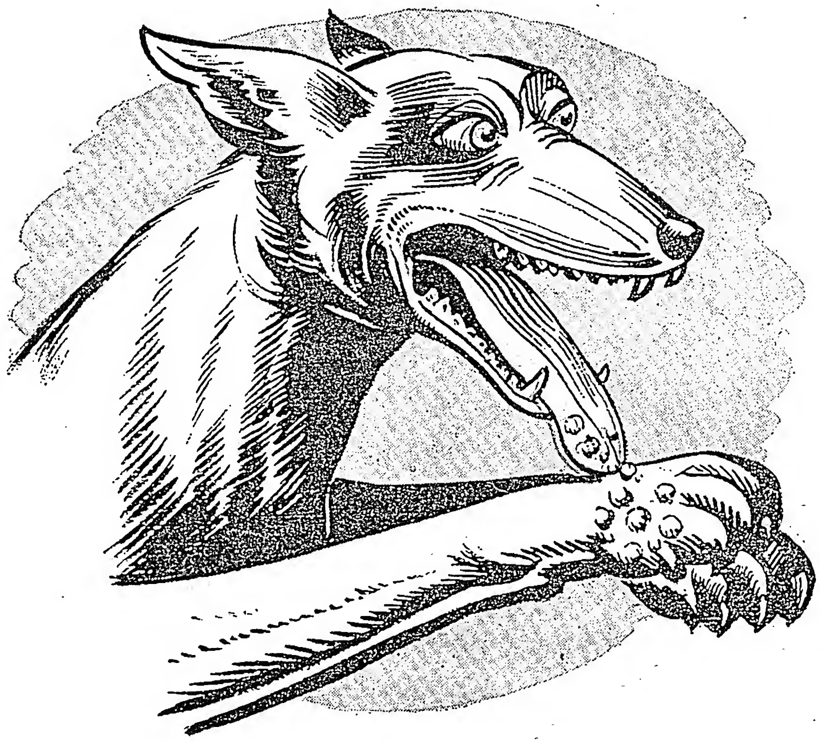
(3) *Application*—to farm practice, in an organized way, of the facts of research learned through education

(4) *Selection*—of the most valuable products or practices found by measuring the results, when established facts are applied by many farm people

(5) *Distribution*—to all the farm people of the most valuable products or practices developed by the application of the facts of research, tempered by farm experience

The Extension work in the United States, undoubtedly, will always remain a model for countries thinking of introducing such a system at home. Here, however, a word of caution may be added. The United States has followed a unique course of development. The United States Extension Service had its beginning under exceptionally favourable circumstances. One should not, therefore, be dazed by the colossal Extension organisation functioning in that country. Local conditions have to be carefully considered before launching any such scheme.

RABIES



By

S. P. BERI, Animal Husbandry Department, Ajmer

RABIES is an acute and rapidly fatal disease, principally affecting canines. It is also communicable to man by the affected animal biting him. The most characteristic symptom of the disease in human beings is a great dread of water. Due to this reason, rabies is termed hydrophobia, meaning 'fear of water', when it affects human beings. This term, however, is not applicable to animals, since 'fear of water' is not a symptom in them.

This disease is found in most of the countries of the world. It has been practically stamped out from the British Isles, due to the effective enforcement of measures like six months' quarantine of all imported dogs, destruction of all stray dogs and such other precautions.

The infective agent is a virus which cannot be seen by ordinary microscopes. This is present in the saliva of rabid animals and is introduced into the tissues through a wound usually inflicted by the teeth of affected animals. The infection can occur through any wound soiled with infective saliva. The infection travels up to the brain through the nerves.

DANGEROUS DISEASE

Even though the total number of domestic animals dying of this disease every year in India may be comparatively smaller than of other diseases like rinderpest, yet rabies remains one of the most serious and dreadful diseases due to the following main reasons:

(i) Death is sure once the animal starts showing symptoms of the disease

(ii) Man can also be infected by the animals

SOURCE OF INFECTION

Though almost all species of animals are susceptible to rabies, the dog remains the main source of infection in our country. According to Ahuja and Brooks, out of the 44,869 human cases in 1949 which got anti-rabic vaccine, prepared at the Central Research Institute, Kasauli, dogs were responsible for 89.2 per cent and jackals for 6.8 per cent of the bites. In addition to dogs, jackals and wolves, rabies has been reported in India in such animals as cattle, the horse, mule, camel, cat, monkey, mongoose, hyena, tiger, panther and the elephant.

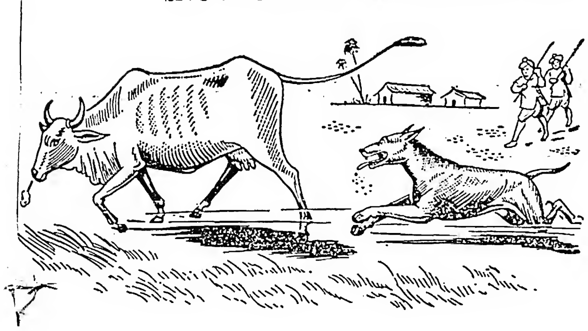
Mice, rats and monkeys are readily susceptible to rabies when artificially infected for experimental purposes but in nature, these

animals rarely suffer from rabies. No case of hydrophobia has been recorded in India as a result of a rat-bite or monkey-bite.

SYMPTOMS

Symptoms in animals which are in the main responsible for the infection of the disease in India, in some domesticated animals and man are briefly given below:

Dogs: In dogs, the disease takes either a furious or a dumb form. There is no fundamental difference between the two forms, except that in the furious form the period of excitement is more pronounced as compared to the dumb form. The constant and common feature of both the forms is that the animal ends in paralysis followed by death within five days. In the furious form the symptoms may start with excitement, manifested by wandering over long distances in the case of pariah dogs and hiding in dark places in the house, accompanied by excessive friendliness towards the owner in the case of pet dogs. The animal starts attacking living or imaginary things without provocation. The voice becomes altered in character. In pet dogs, biting its own chain and such other objects is a common feature. An affected pariah dog, while running long distances may aimlessly bite any one coming in its way, but will not chase or make any special effort to bite a dog or other animal going away from it.



In the dumb form of rabies, the excitement period being less marked and shorter, the symptoms seen are paralysis of the lower jaw, protrusion of the tongue and salivation. In both the forms, the primary symptoms are followed by paralysis of the hind legs before death.

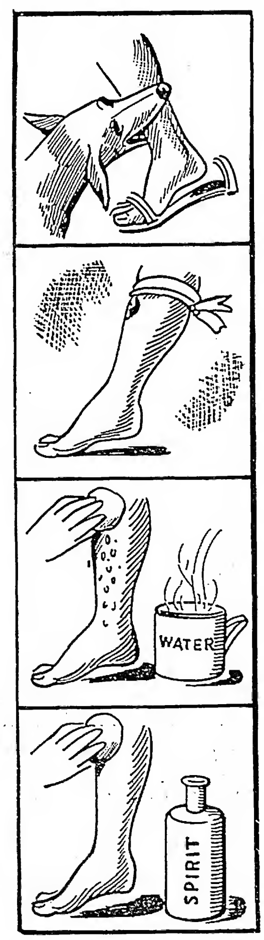
Jackals: Jackals usually run away on seeing human beings. If a jackal attacks a human being, it should be presumed to be rabid.

Cattle, sheep and goats: Cattle manifest signs of fury by frequent striking of feet on the ground, bellowing and a general disposition to do damage. There is dribbling of saliva from the mouth. These symptoms are followed by paralysis commencing with the hind limbs. Symptoms of rabies in sheep and goats are very much similar to cattle. These animals generally do not bite other objects.

Horses: In horses, the stage of irritation is generally well-marked. They may bite themselves and other objects like the manger. Symptoms of excitement are followed by paralysis affecting the throat muscles and hind limbs.

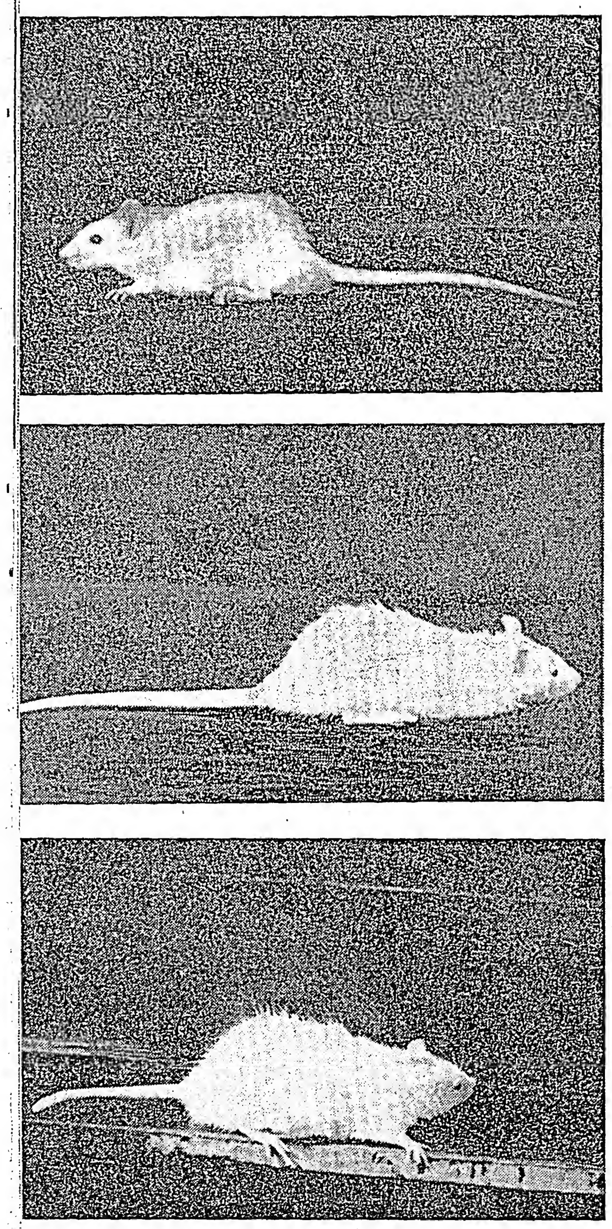
Human beings: The symptoms usually start with depression, anxiety or fear accompanied by pain at the site of the bite. There is a slight rise in temperature. There is a disinclination to drink liquids, especially water, and when the patient tries to drink water there is a sudden spasm of the throat muscles, with the result that the patient feels choked and may emit peculiar sounds while struggling to take his breath. At this stage, diagnosis is not very difficult and specially so when there have been reports of dog bites. This stage gradually passes into exhaustion and general paralysis. which soon ends in death.

(*Contd. on page 28*)



Food value of GHEE, VANASPATI AN

By N. D. KEHAR, Animal Nutrition Division, Indian
Veterinary Research Institute, Izatnagar



A

B

C

In the 1st generation no difference in growth is observed between (a) "ghee" (b) "vanaspati" and (c) oil groups

FAT is an essential constituent of human dietary. It acts and only as a source of energy but also as a supplier of essential fatty acids and a carrier of fat-soluble vitamins, namely, A, D and E.

CLASSIFICATION OF DIETARY FATS

The dietary fats can be classified into two broad groups, viz., (1) those of animal origin, like butter, lard, etc. and (2) those of vegetable origin, like mustard (*Brassica nigra*), *til* (*Sesamum indicum*), groundnut (*Arachis hypogea*) and coconut (*Cocos nucifera*) oils, etc. Chemically these materials are similar, being compounds of glycerine with certain types of organic acids. The oils which are liquid at ordinary temperature can be hardened by hydrogenation—adding hydrogen with the help of a catalyst which aids this process. This hydrogenated product is popularly known as *vanaspati*.

The average Indian generally prefers *ghee* (clarified, heated butter) to oil or other types of fat. During and after the Second World War, most of the articles of human consumption including *ghee* were in short supply. The shortage of *ghee* was at one time considered to be approximately 400 per cent. The extremely high prices of *ghee* made it unavailable to the common man and various kinds of *vanaspatis* became popular in the early forties as they resembled *ghee* in appearance and were comparatively cheaper.

FOOD VALUE OF 'VANASPATI'

There is much controversy about the nutritive value of *ghee* as compared to that of vegetable oils, both in the natural as well as in the hydrogenated forms. This controversy is prevalent among research workers both in India and other countries. In view of the divergent opinions held by scientific workers, on the nutritive value of different fats and oils, and also because of the use of such terms as vegetable *ghee* as synonyms for *vanaspati*, it was considered worth while to undertake a study of the nutritive values of the latter as compared to those of the former.

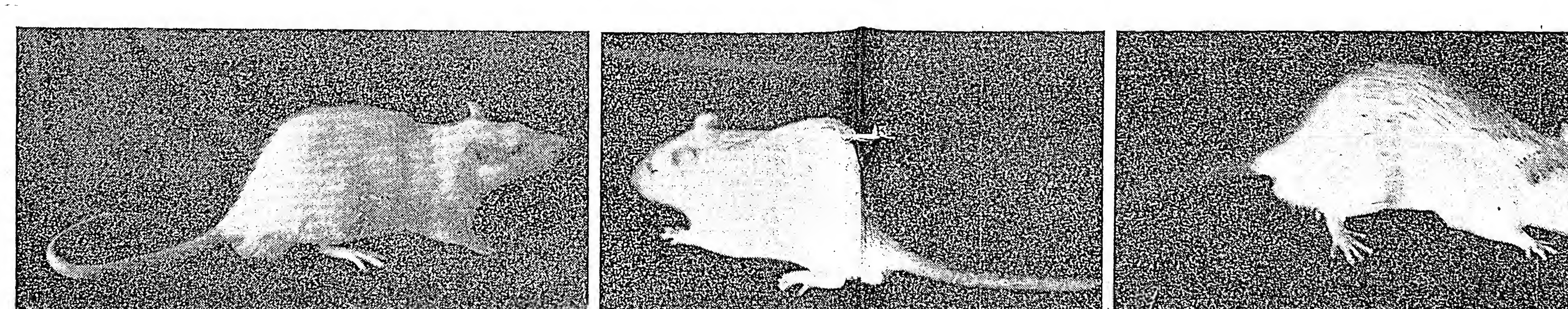
Appreciating the immense importance of this problem, investigations were undertaken to determine the nutritive values of raw and refined mustard, *til*, *mohua*, (*Bassia latifolia*), coconut, cottonseed (*Gossipyum sp.*) and groundnut oils commonly used for edible purposes in different parts of the country, and eight brands of *vanaspati*, viz. Dalda, Swastika, Kotogem, Temple, Rajhans, First Quality No. 1, Binaula and Cotex. The nutritive values were compared to those of *ghee* as affecting growth, reproduction and lactation. The effects upon the absorption and utilization of vitamins (A and B), calcium, phosphorus and protein were also studied.

This work was carried out in two series with rats as experimental animals. In the first series, the fats were incorporated at a five per cent level in a synthetic diet containing sub-optimum quantities of vitamin A and possibly also of vitamin B-complex. In the second series, these fats and oils were incorporated at the same level, in some Indian dietaries of poor quality. The indices for comparison in both the series were growth, general health, as well as reproduction and lactation.

SYNTHETIC DIET EXPERIMENTS

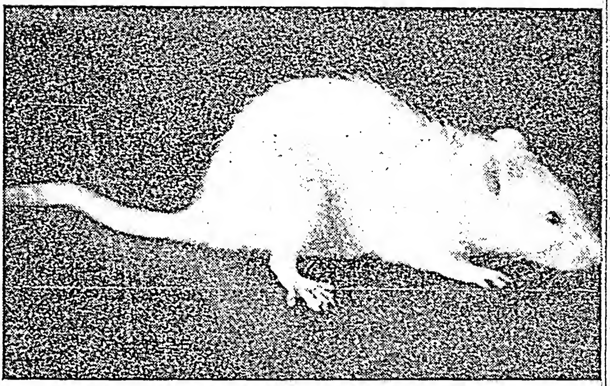
The experimental rats were fed on a purified diet in which protein was supplied from casein, carbohydrates from starch or cane-sugar and minerals from pure salts. The diet contained sub-optimum quantities of vitamin A and possibly also of vitamin B-complex. Such a diet was selected with the specific object of simulating field conditions. This diet together with five per cent *ghee*, *vanaspati* or oil was fed to different but similar group of rats and the experiments were carried out for over three generations.

On liberal diet no difference in growth was observed between (a) "ghee" (b) "vanaspati" and (c) oil fed-rats

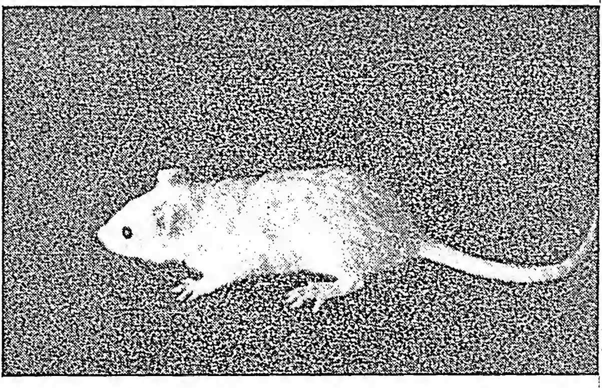


ND OILS

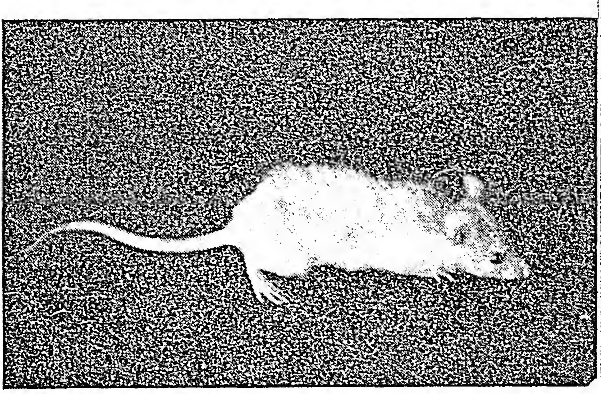
A



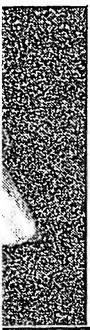
B



C



In the second and subsequent generations, rats on (a) cow-"ghee" show better growth than those on (b) "vanaspati" and (c) oils



A

Normal coat in (a) cow-"ghee" group and (b) alopecia (hairlessness) in "vanaspati" groups

B

Effect on growth: It was found that in the first generation there was hardly any difference in the growth-promoting values of different fats.

In the second and subsequent generations, the rats of the cow-*ghee* groups showed, in general, a much better growth than the animals fed on *vanaspati* or raw or refined oils. Among the different oils and the various kinds of *vanaspati* themselves, there was hardly any material difference. As between oils and the various kinds of *vanaspati* there was not much to choose.

Reproduction and lactation: In regard to reproduction and lactation, no marked difference was observed between the various groups fed on various kinds of *ghee, vanaspati* or oils in the successive generations.

Liberal feeding: The oil or *vanaspati*-fed animals, which had shown poor growth on the basal ration, when given to a liberal feeding, i.e. when vitamins and other essential dietary factors were added, made rapid gains in weight and very often equalled the *ghee*-fed rats within a few weeks.

EXPERIMENTS WITH REGIONAL DIETARIES

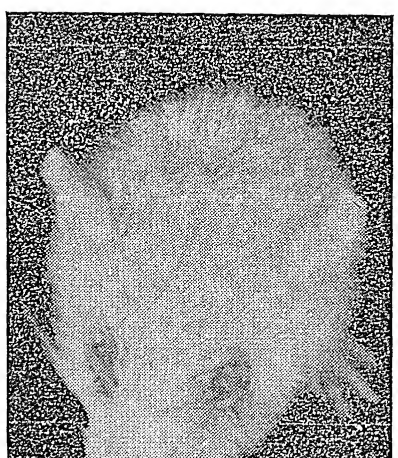
In the second series of experiments, *ghee, vanaspati* and oils were added either to the Bengali or to the North Indian diet as used by an average man of low-income group. These experiments were confined to one generation only but were spread over a long stretch of time.

BENGALI DIET

The Bengali diet was, on analysis, found to be very poor in calcium, protein and vitamins. The effect of feeding this diet over a prolonged period gave the following results with regard to growth and general health.

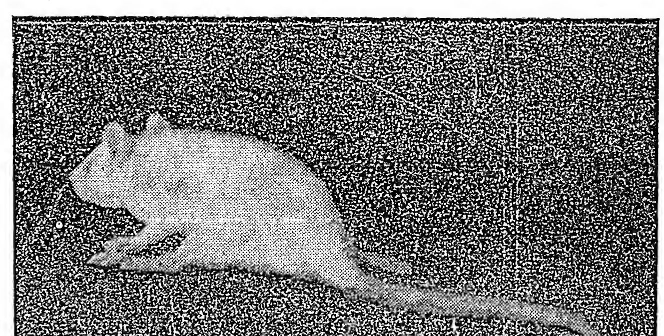
Growth: On feeding the Bengali diet with either *ghee*, *vanaspati* or oils the growth obtained was uniformly poor and practically no difference could be observed between the various oil and fat groups.

On supplementing the diet with extra vitamins, although the gain in weight of rats, in each fat group,



A

B



Rats fed on poor Bengali diet with certain "vanaspatis" for a prolonged period exhibit (a) xerophthalmiae (eye symptoms (b) paralysis

was much higher than on the unsupplemented diet, no difference in the growth-promoting values of the various fats could be discerned.

General health: On prolonged feeding of the Bengali diet, various pathological symptoms like alopecia xerophthalmia and paralysis were seen in rats consuming *vanaspati* of certain brands. These symptoms were generally observed after the nineteenth week of feeding. Animals fed on cow-*ghee* were found to be comparatively less affected.

As *vanaspati* contains no vitamin A and *ghee* is a fairly rich source of this vitamin, it was concluded that most of these deficiency symptoms seen in the *vanaspati*-fed rats might be due to chronic vitamin A deficiency.

NORTH INDIAN DIET

In the other group the dietary tried was that of an average man in North India. This diet was, on analysis, found to be richer than the Bengali diet. On feeding this diet with cow-*ghee*, various kinds of *vanaspati*, or oils at the same level, it was observed that the group of animals fed on cow-*ghee* grew at a better rate than the littermates given the same diet containing oil or *vanaspati*.

When the diet was supplemented with extra vitamins, it was observed that the animals showed more rapid growth and the differences in the growth rates with various fats, i.e. *ghee, vanaspati* or oils disappeared.

Thus it would be seen that whereas on a sub-optimum diet cow-*ghee* proved to be the best fat, on a liberal diet, the animals receiving *ghee* or any of the other fats fared equally well. Also, on very poor diets, which are deficient in many essential nutrients, no difference between one fat and another worked with in these experiments could be observed.

SUBSIDIARY EXPERIMENTS

The above experiments indicate that with a sub-optimum diet, *ghee* appears to give better results than crude or refined oils or *vanaspati*. When, however, the animals of the oil or *vanaspati* groups are switched over to a liberal diet, the difference between the group of animals fed on cow-*ghee* and oil or *vanaspati* diminishes.

In order to find out the reasons for the superiority of the cow-*ghee* over other fats and oils, when incorporated in a sub-optimum ration, a number of subsidiary experiments were conducted to find out the digestibility of fats and oils, the comparative effects of different dietary fats on protein metabolism, calcium and phosphorus absorption, utilization of carotene and requirement of B vitamins.

The digestibility of fats and oils: Experiments carried out to study the digestibility of cow-*ghee*, buffalo-*ghee*, crude and refined mustard, *til, mohua*, coconut, cottonseed and groundnut oils and eight different brands of *vanaspati*, when fed at a five per-cent level, showed that the digestibility of all the fats and oils studied was more or less of the same order.

Calcium, phosphorus and protein metabolism: Experiments carried out to determine the utilization of calcium, phosphorus and protein, when *ghee*, oils or *vanaspati* were used in the diet, showed that some of the oils and *vanaspati* yielded results comparable to cow-*ghee* as regards the absorption of calcium, but as for phosphorus cow-*ghee* appears to give better results than any other fat.

With regard to protein, it was found that whereas all the fats and oils studied were more or less equally efficient in improving the digestibility of the ingested protein, cow-*ghee* was superior to others in raising the biological value of the protein in the diets.

VITAMIN 'A' IN 'GHEE', OILS AND 'VANASPATI'

Cow-*ghee* is a good source of vitamin A. Its yellow colour is due to the presence of carotene (a precursor of vitamin A). Buffalo-*ghee* generally does not contain carotene and its vitamin A content is usually lower than that in cow-*ghee*. *Ghee* ordinarily available in the markets generally contains a very small amount of vitamin A.

Vegetable oils were formerly reported to contain no carotene. But it has been found that cottonseed, *mohua, til*, mustard and groundnut oils contain small amounts of carotene. Refined oils or *vanaspati* do not contain vitamin A.

VITAMINS A AND B-COMPLEX

When the experimental feeding periods of rats used in different groups for studying growth rates were over, the livers of these rats were examined for their vitamin A content. It was observed that the greatest amount of vitamin A was found in the case of animals of the cow-*ghee* group.

Experiments carried out with two members of vitamin B-complex, viz. H thiamin and riboflavin showed that under identical conditions rats fed on cow-*ghee* required less of these vitamins than those fed on *vanaspati* and oils.

Refining as well as hydrogenation of oil seemed to lower the capacity of the liver to store vitamin A.

In another experiment equal amounts of carotene were fed to rats in different oils, *vanaspati* or *ghee*. It was found that the efficiency of utilization of ingested carotene, as measured by the percentage recovered as vitamin A in the liver, was better with cow-*ghee* than with either *vanaspati* or oils.

HEATING AND THE VITAMIN 'A' CONTENT OF 'GHEE'

Since *ghee* and other fats are used for cooking, observations made to determine the effect of heating on their vitamin A content showed that when *ghee* was heated to 180°C. for half an hour, 50 per cent vitamin A was destroyed. Similar observation holds good in the case of oils and *vanaspati* as well.

BUILDING-UP A BETTER EWE FLOCK

By
S. JAYARAMAN and B. B. BUCH

IF the sheep maintained by our flock-owners have to bring in very good returns, proper attention should be given to ewes. At present, flock-owners tend to pay a lot more attention to the ram, with comparatively very little attention being paid to the ewes.

The ram no doubt plays an important job in the flock, but putting a high class ram in the flock and neglecting the ewe will not help in building up the productive level of the flock. What is, therefore, needed is that equal emphasis is also laid on the good management of the ewes.

Good management principles include attention to breeding, feeding and good care in general of the ewes.

In our villages, ewes are bred throughout the year, with the rams running with the ewes both day and night. Lambs are never weaned. This results in ewes starting their breeding cycle at ten and twelve months, much earlier than what is desired. The progeny as a consequence are poor, and the productive life of the ewe is also shortened. Since ewes would not have been fully grown at this breeding age, all ewes breeding before they are 15 to 18 months old will remain stunted and will be poor 'doers'.

Allowing the rams to run with the ewes all the year round has other disadvantages as well. As lambs are dropped the year round, they will not be uniform in age. A high mortality will also result in lambs dropped during periods when climatic extremes are felt. A number of ewes get conceived twice in the year and drop two crops of lambs in the same year, which will not be economical under the grazing conditions available in the country.

Male lambs, which can best be disposed of for mutton in early winter, will naturally fetch a lower price in the market as they will not be uniform in size. Returns from the wool clip are also affected owing to a lack of uniformity in the first wool clip, as it comes from lambs of varied ages. Some ewes are likely to remain empty due to the excessive strain on breeding rams.

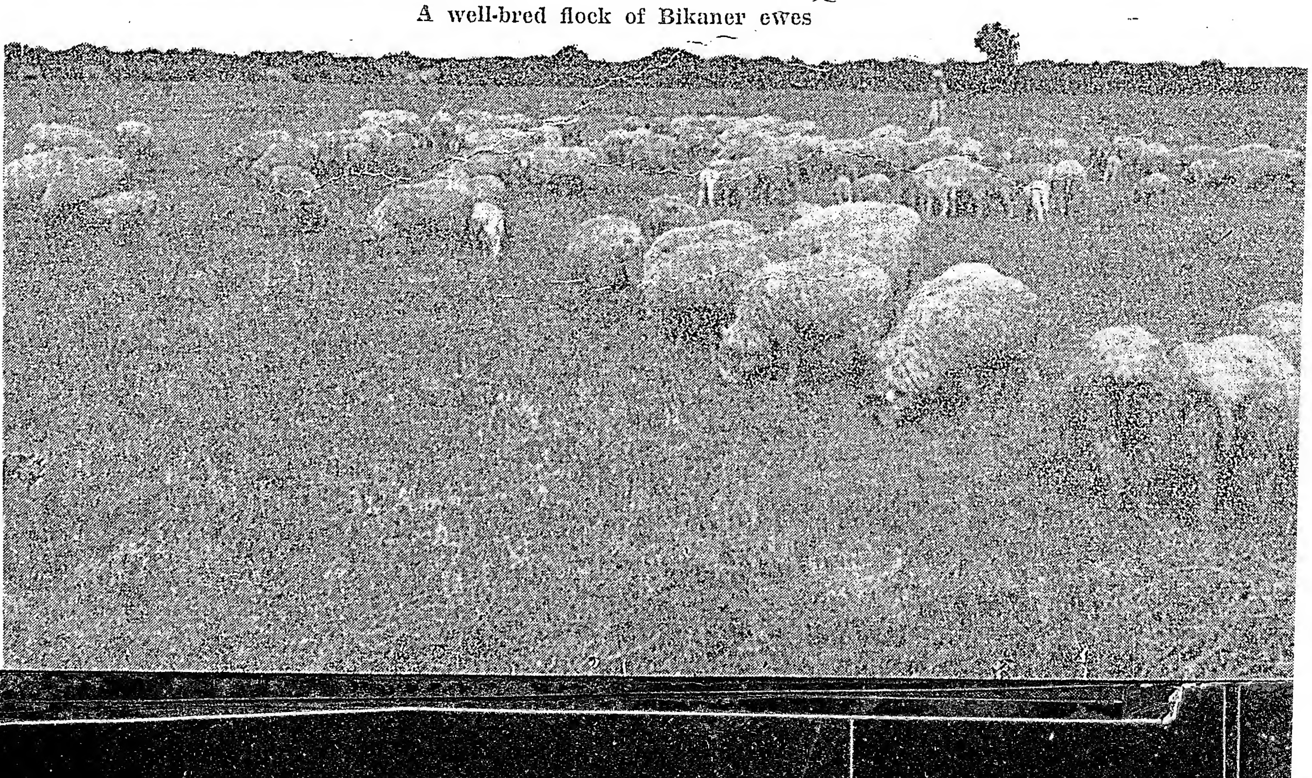
Considering these disadvantages, it is essential that the common practice of leaving rams with the ewes throughout the year should be discontinued, and a particular breeding season should be fixed for the dropping of lambs.

UNECONOMICAL SYSTEM

Experiments conducted at the Government Livestock Farm, Hissar, have proved that the practice of obtaining two crops of lambs a year retards flock improvement and such a system under Indian conditions is uneconomical. Ewes dropping lambs twice a year can never develop fully and their lambs will have their growth retarded. In the long run there will be a marked deterioration in the flock. Further, the additional feed and fodder requirements due to the extra strain cannot be fulfilled through grazing alone. Hence only one crop of lambs in a year must be aimed at.

The fixing of the breeding season will depend upon the period during which it is desired to have the lambs born. Lambing should be so adjusted that it coincides with the time when grazing is in plenty so that there may be the least strain on the ewes. Further, lambing should be at a time when the climate is also temperate. After fixing the lambing period, it is easy to adjust the mating season. This should be five months in advance of the lambing period, which is approximately the period of pregnancy in the ewes. The

A well-bred flock of Bikaner ewes



mating season should not last for more than two or three months.

THE RIGHT PLAN

The ewes should be divided into groups of 40 to 50, and each group folded in a separate pen. This facilitates systematic breeding since one ram is enough to serve all the ewes in each pen. The ram should be let in with the ewes only at night, after the ewes return from grazing and should be removed from the pen at daybreak next day. This arrangement permits the ewes to graze undisturbed during the day, at the same time allowing the rams to rest between the mating hours.

All ewes must be branded or marked for identification in the different pens to detect ewes entering a wrong pen before the ram is put in for service. It is a good policy to check up each evening whether the ewes are in their proper pens. The ram must also have a similar identification mark. If it is desired to record the date of service for the ewes, a colour paste may be applied on the ram's brisket in the evening just before putting it with the ewes. Ewes that are served during the night will be detected the next morning by the colour mark left on their rumps. In order to detect ewes that have missed a fertile service at the first service but get served again in the next heat period, a different colour may be used every 17 to 18 days. During the first ten days after the commencement of the mating season, a close watch should be kept to see that the ewes are properly served.

Pregnancy and lactation are heavy strain on the ewe. Naturally, the ewe requires a period of rest after each pregnancy and lactation. It is, therefore, absolutely necessary to wean lambs when about four months of age to allow the ewes to have a resting period before the onset of the next mating season. Weaned female lambs should be kept away from the rest of the flock until they are fit for breeding.

FEEDING THE EWES

The main income from the sheep to the farmer is derived from the sale of sheep and its products for which it is essential that they may be efficiently and adequately fed. It is, however, imperative that the feeding must be very economical with no detriment in efficient production.

During summer, flocks need good pasture, shade, salt and plenty of pure water. Salt should be available for the sheep at all times. A sheep needs about one to six quarts of water daily, depending upon the feed, weather conditions and the water-content of the forage.

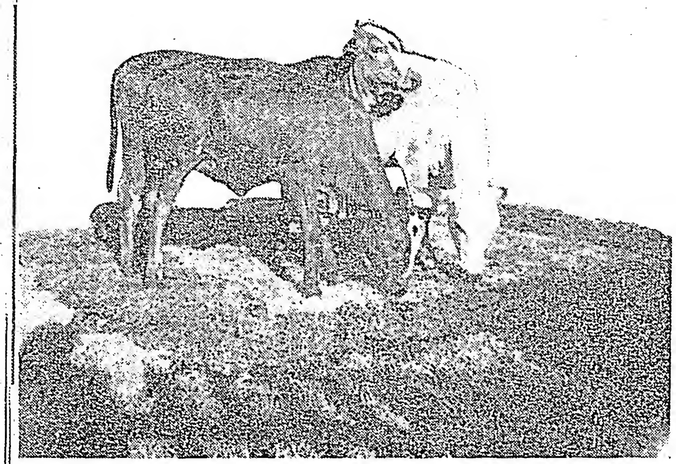
It was observed at the Government Livestock Farm, Hissar, that grain-feeding of ewes throughout the year did not result in any extra returns except that the advantage of grain-feeding was apparent in the first two years of the ewe's life, after which the productive value of both the grain-fed and non-grain-fed groups was the same. Sheep, therefore, should be fed on grazing alone bearing in mind, however, that nutritious grazing should be provided. Overstocking on any piece of land, however rich in nutritious grasses, must be scrupulously avoided, as under-nutrition with its adverse effects will result. If possible, it is a good practice to divide pastures and to graze the flocks by rotation. This practice will also aid in reducing the losses due to worm infestation.

Although feeding of ewes with grain is not economical, there are occasions when grain-feeding becomes necessary and advantageous. Placing ewes on a rising plane of nutrition for a period of about two or three weeks prior to the mating season, a practice known as 'flushing', tends to increase the proportion of twin lambs and to bring all the ewes in heat nearly at the same time, resulting in a more uniform lamb crop. The following concentrate mixture will be found useful:

Gram	2 parts
Bran	1 part
Salt	1 per cent
Sterilized bone-meal	1 per cent

A $\frac{1}{4}$ to $\frac{1}{2}$ lb. of the above mixture may be fed to each ewe.

(*Contd. on page 27*)



A group of calves fed on three per cent refined groundnut oil in skim milk

Feeding Dairy Cattle

By
C. P. ANANTAKRISHNAN,
Indian Dairy Research Institute, Bangalore

EVERY year, dairymen raise a large number of calves for replacements in their herds. They are fed on whole milk, and the quantity thus utilized for feeding calves alone is pretty large. For one thing it means so much less milk available for human consumption, especially so at a time of milk-shortage, and for another the dairymen have to meet the higher cost of rearing the calves as a result of feeding them with whole milk.

Butter-fat is essential for the growing calf; more so in the initial stages. But if an alternate and cheaper source of supply of butter-fat could be found for feeding calves, it would certainly reduce rearing costs and direct more milk for human consumption.

Experiments conducted at the Indian Dairy Research Institute, Bangalore, showed that cheap alternate feed could replace milk. Refined groundnut oil and hydrogenated groundnut oil, instead of milk-fat, were tried in feeding calves with good results.

Refined groundnut oil at three per cent level and hydrogenated groundnut oil at four per cent level were used in skim milk and calves fed on these were compared with those receiving three per cent and four per cent butter-fat through whole milk respectively, and the growth and general condition of the groups observed. Calves not receiving milk were given shark liver oil to supply vitamins A and D. The other feeds given was common for all the groups.

Results showed that groundnut oil at three per cent level or hydrogenated groundnut oil at four per cent level in skim milk can be a very good substitute for whole milk in raising young calves. These vegetable fats, therefore, can be used instead of whole milk, thus reducing the cost of rearing calves and making more milk available for the people.

HIGHER VITAMIN 'A' CONTENT

Another interesting result of research obtained at the Institute was the possibility of increasing vitamin A content of milk of the cow during certain months by

(*Contd. on page 32*)

(Left) An experimental calf (four per cent hydrogenated oil); (Right) the control calf (four per cent milk-fat)

AGRICULTURE IN BOMBAY STATE

By
V. P. BHIDE

THE Bombay Government have already spent Rs. 50 crores in the last two years for the implementation of the Five Year Plan in respect of agricultural development. During 1952-53, an area of 1,17,000 acres was covered by new bunding work and 42,000 acres were covered by mechanical cultivation. The area of *khar* (salt) land reclaimed during the year was 13,500 acres. In the field of minor irrigation, 42 schemes have been implemented and seven are in progress. With the help of a loan of rupees one crore sanctioned by the Government of India for minor irrigation works 84,100 acres have been brought under irrigation already and this area will increase to 1,10,000 acres when all the projects are implemented.

Of the total area of about 31 lakh acres under paddy in the State, about 17 lakh acres are under transplanted paddy. From this area, nearly four lakh acres are suitable for the Japanese method of rice cultivation, since rainfall in this region is assured. The adoption of this method is expected to save about 400 tons of paddy seed besides increasing the crop yields considerably. Demonstrations of the Japanese method of paddy cultivation have been organised in various centres in the rice growing districts. Provision has also been made to advance *taccavi* loans to farmers for adopting this method for purchase of seed, fertilizers, etc.

Two farmers, Shri Laxman Gopal Mali of Shivre village and Shri Kallappa Barma Chougule of Ashta village won first prizes in the 1952 *Kharif* crop competition held at the State level. By adopting improved methods of cultivation and a liberal application of the compost obtained from town and rural wastes, farmers of village Bidanhal, near Hubli in Dharwar district, have increased yields of *jowar* from four to six times per acre.

Bast fibre extracted from cotton stalks by retting appear to be promising as a substitute for jute. Improved cotton varieties, viz. Virnar and Jarila yield fibre as good as jute. In experiments with irrigated Combodia-4 and non-irrigated Jarila cottons, the former gave an yield of $3\frac{1}{2}$ maunds of fibre per acre, whereas that of the latter was $1\frac{1}{2}$ maunds. The fibre, though too coarse to be spun by itself, can be mixed with jute for gunnies or made into ropes and cords.

SEASONAL PESTS OF CROPS

(*Contd. from page 8*)

from where they return to the plains when mustard crop is again in the field. It is a very common phenomenon to see the winged aphids flying about in the warm evenings in April and the beginning of May. Sometimes in our wanderings in the field at about this time our clothes are covered with these winged forms. Several overlapping generations are present during the period November to March. Cloudy and moist weather is conducive to the rapid multiplication of the pest in the plains, and when these weather conditions prevail we must always expect a widespread outbreak of the pest.

CONTROL MEASURES

But for the fact that the pest is kept under check both by physical and biological factors, the damage caused to the crops would have been far more serious than what it is today. Wind and rain and fluctuating temperatures cause appreciable mortality among the aphid population. In addition there are a good many parasites and predators that take a heavy toll of the pest. Aphids are parasitized by braconids and predated upon by the grubs and adults of lady-bird beetles, by the maggots of syrphid flies and the young ones of chrysopids and 'hemerobiids'. A fungus disease also destroys them in large numbers under favourable conditions and their characteristic way of living in large numbers and almost touching each other makes the task of the fungus all the more easy. The following control measures are recommended to bring down the pest population effectively in the field:

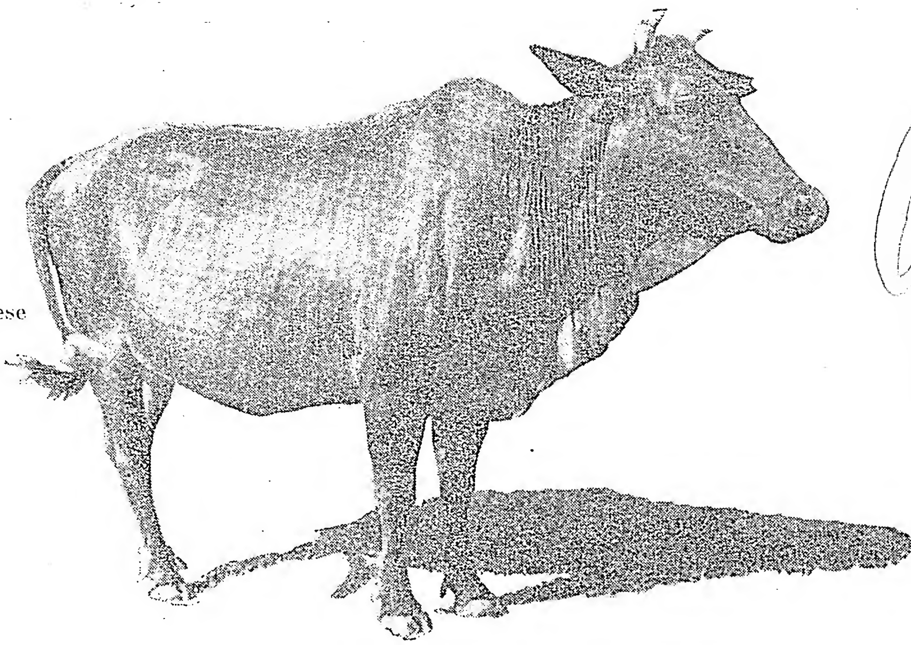
(1) Clean cultivation is very important to control the pest effectively and all weeds growing in the vicinity of mustard fields and serving as alternate food plants for the pests should be destroyed and burnt.

(2) In the early stages infested shoots should be pruned and the aphids destroyed. This simple and timely operation will keep the pest from multiplying.

(3) Dusting may be done with one to four per cent actual nicotine at the rate of 15-20 lb. per acre.

(4) Dusting with rotenone 0.5 to 0.75 per cent and pyrethrin (one part of 0.9 per cent pyrethrin in five parts of talc) may be done at the rate of 15-20 lb. per acre according to the density of the pest-population.

Heavy infestation of aphids will require the dusting operations to be repeated at weekly intervals for an effective control of the pest.



Nepalese local cow

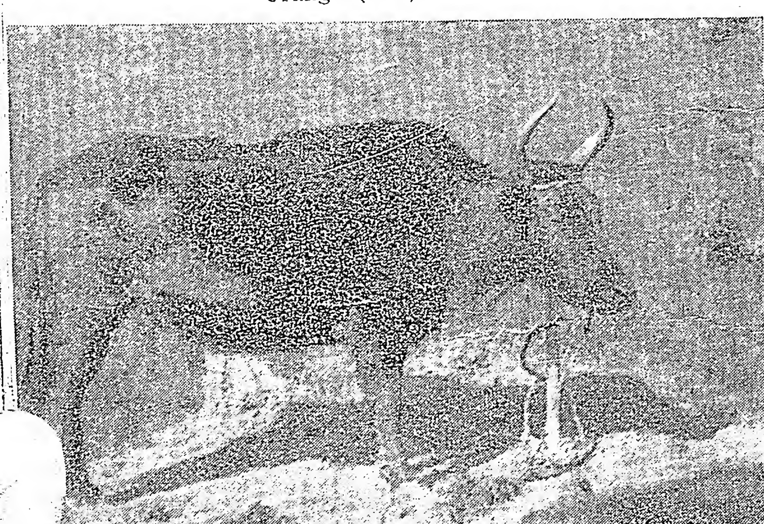
Yak in The Nepal Himalayas

By G. P. SHARMA,
Livestock and Dairy Development Officer, Government of Nepal

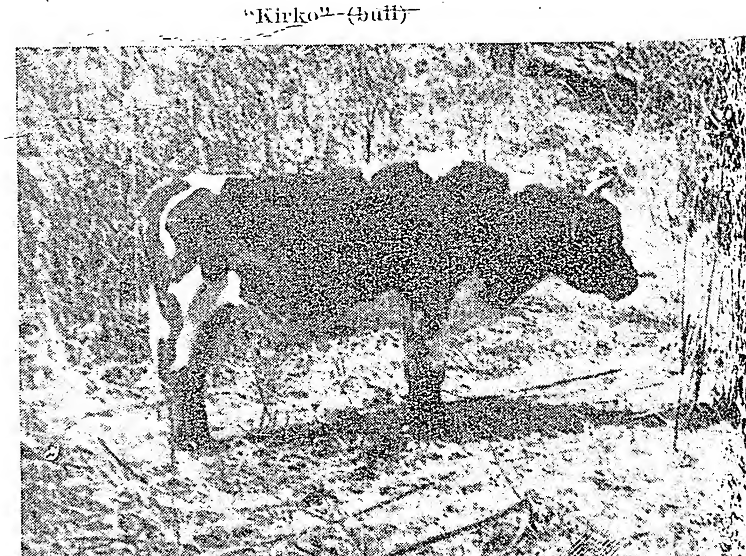
MANY people are familiar with the word yak but the habit and habitat, general characteristics, utility of this animal, etc. are comparatively unknown. This is because suitable literature on the subject is not available due to the secluded state of snow-covered areas where this animal is found. The common belief that this animal is primarily used as a beast of burden in the snowy areas is quite erroneous, as in Nepal, the yak is kept specially for two purposes, viz. wool production and cross breeding.

The yak belongs to the bison group of animals, which includes also the bisons of Europe and America. The yak, however, is inter-fertile with the animals of the taurine group. Accordingly, the yaks are mated with ordinary cattle to produce hybrids,

"Urang" (cow)



"Kirko" (bull)



which are of great utility in the area. But it is rather peculiar that among the hybrids while the males remain sterile, the females reproduce normally.

HABITS AND HABITAT

The original home of the yak is believed to be the cold regions of Tibet and Siberia. Many herds of this animal are, however, found along the snow-covered mountain ranges of northern Nepal. But it cannot be said at present whether these animals actually belong to this part of Nepal or were originally imported from the neighbouring country, Tibet. These animals are usually reared on the ranch-system and the breeders drive them over long distances in the snow and semi-snow ranges in search of pasture. From June to November the animals are kept at an altitude of 12,000-16,000 ft. After this period they are gradually driven down to lower altitudes, and by January they come down to a region of about 10,000 ft. in height where they remain for the three subsequent months. As these places begin to warm up in April, the animals again set out for higher regions. From the point of view of pasture, the first three months of the year are really hard for the female yak. As a result, milk yield in the females becomes very low during this period. The only trees that remain green during this period are *Quercus incana, Q. semicarpifolia* and *Q. dialatata*. The herdsmen utilize the leaves of these trees to provide green roughage to their stock. Though very fibrous and fed in small quantities, these leaves save the animals from starvation. At one place called Langtang, slices of dried turnips, soaked in warm water, are also fed to the animals as a supplementary feed. But this does not seem to be a common practice.

These animals are never stalled except in the very young stage when they happen to be two-three months old. During the night all the animals are tied to wooden pegs in the open; a couple of dogs are provided to keep away the wild beasts. A heavy snowfall does not appear to cause much discomfort to these animals.

GENERAL CHARACTERISTICS

Both the males and females are attractive to look at with their long silken hair hanging below the neck, shoulders, stomach and thighs. Their body though heavy is compact and quite well-balanced. Their legs are short and strong, the hoofs black with pointed tips with the help of which they are able to run with speed on slopes.

The colour of the female yak varies, though a mixture of black and white seems to be common. White, grey and black yaks are also to be found.

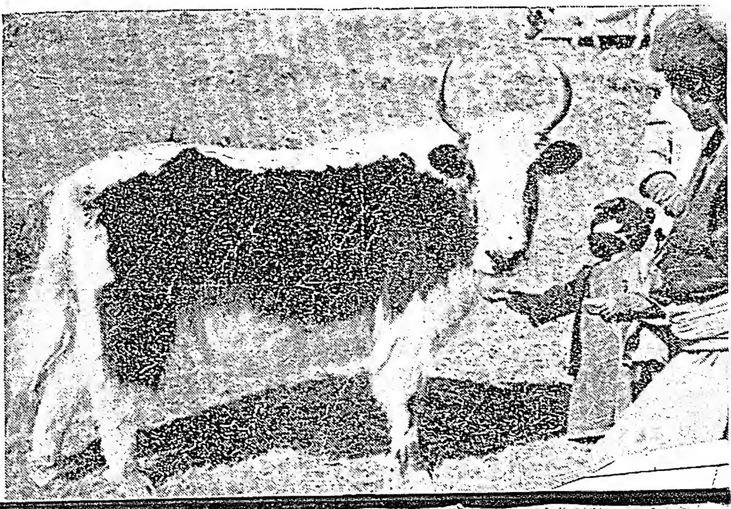
The yaks are docile if gently handled, in spite of their semi-wild nature. But a yak becomes nervous when any stranger approaches it.

Both sexes have massive heads. The yak's head looks slightly drooping owing to a heavy hump. The forehead is broad and bulging. Whereas the face of the female yak is clean, though rough, that of the male yak is covered with curly hair. The horns are peculiarly curved, first protruding outwards, then curving upwards and inwards with pointed tips directed backwards. They are thicker and heavier in the male yak.

The neck is short and thick, carrying the head smartly on the level of the back. There is no dewlap. The chest is broad and muscular, though not deep. The hump is only slightly raised on the back but looks more developed from the front, and is heavier in the male yak. The shoulders are muscular and strong. The legs are short and moderately thick.

The female yak

"Dimjo" (cow)



The loin is strong and levelled with rounded hip-bones placed wide apart. The rump is short and slopy. The thighs are wide, muscular and well-developed. The tail is thick and short, though apparently it looks long due to the long bushy development of hair.

The udder is completely hidden within a thick growth of hair and is not much developed. The teats are thin and small.

UTILITY

As stated earlier the yak is commonly used for cross breeding. The hybrids are highly valued. Milk and wool are also obtained from the yaks. The long hair growing on the tail and other parts of the body is removed, usually in the months of May and June, and is used for making ropes, bags, floor-mattings, shoes, etc. These articles, though coarse, are warm and durable. The tail of the dead animal is cut at the tail-head and is sold as *chawar*, which is used by certain peoples on auspicious occasions. Yak's milk has a rich yellow colour, which enables one to recognize *ghee* prepared from it easily. This *ghee* sells at a cheaper rate, as compared to the cow-*ghee*. The average milk-yield per head is estimated to be approximately three pounds a day. Herd-keepers, however, calculate the production in terms of surplus which they can sell after meeting their family requirements. According to them, they sell a little less than one tin (approximately 37.5 lb.) of *ghee* per year from one female yak.

Average lactation period is 2½ years with a dry period of only six months. Most of the cows calve during June-July. The average age of a heifer at the time of first calving is 3½-4 years.

Two distinct hybrids are outcrossed from this species, locally called *urang* and *dimjo*. The former is produced by crossing a yak with a Nepalese cow, whereas the latter is the cross of a Tibetan bull found locally, and known as *kirko* with a female yak. Among the hybrids, the female produces more milk than either of the parent species, and the males though infertile are very strong and swift for carrying loads or drawing the plough. *Urang* is suitable for regions of lower altitude, from 7,000 to 11,000 ft. *Dimjo*, on the other hand, is reared in areas 9,000 to 16,000 ft. above the sea-level. The latter has also longer hair than the former which can be used as a substitute for wool.

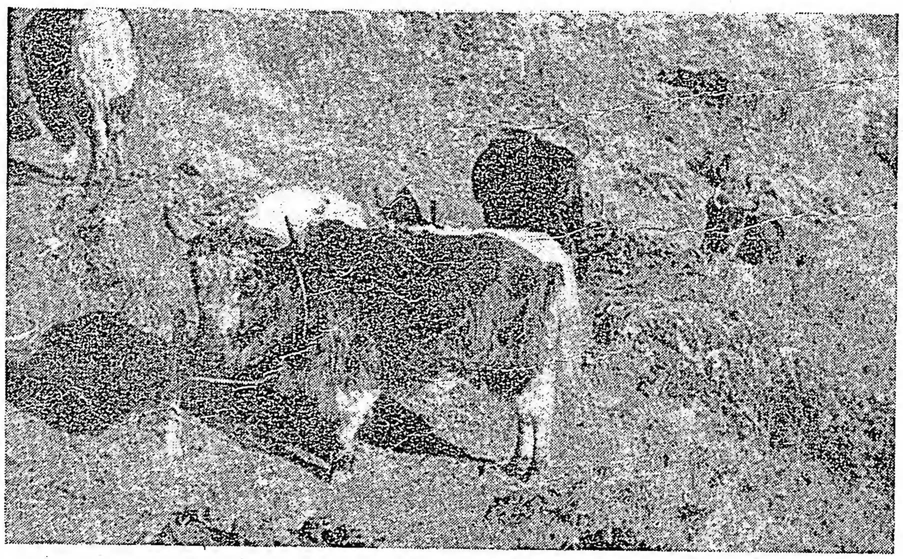
CONCLUSION

From the economic point of view, the yak and its hybrids are of great importance in the Himalayan regions. The ordinary cows and buffaloes cannot thrive in the climate of this region and the scope for profitable agriculture is very limited. The warm and durable articles prepared from the hair of these animals enable human beings to withstand the rigours of severely cold climate of these areas. The beef from yaks supplies proteins of good quality for providing nourishment to the people.

Another important product is milk which brings cash to the herd-owners to buy foodgrains and other necessities. Most of the milk is converted into butter and *ghee* and the former is exported to Tibet; the latter is brought down to the markets of Khatmandu and India.

Hybridization by a wise and more careful selection is expected to go a long way to produce animals of higher economic value which would ultimately raise the living standards of the local people.

The male yak



BUILDING UP A BETTER EWE FLOCK

(*Continued from page 21*)

In addition to the concentrates, they may each be given two to three pounds of green fodder, when available.

PREPARING EWES FOR BREEDING

Preparing the ewes for the breeding season is an important aspect which will have a direct bearing on their fertility. Ewes in a low condition must get extra feed. Provision of nutritious and special feed for two or three weeks prior to mating is a commendable practice. All ewes must be crutched before they are put to the ram. Crutching is the operation of clipping off of all tags or matted wool, hair and dung deposits around the tail and the inside of the things down to the point of the hock.

CARE DURING PREGNANCY

Ewes require nutritious feed, particularly during the last six to eight weeks of pregnancy. Lambs from ewes fed well during this period will be big and heavy, while those from ill-fed ewes will be small and poor in condition. The following points are worth remembering when handling in-lamb ewes:

(1) Pregnant ewes should not be chased and made to run

(2) They should not be frightened; particularly stray dogs should not be allowed to come near them

(3) They should never be driven through narrow passages

(4) Pens should be properly repaired and strengthened before the onset of the lambing season to avoid any mishaps from the attack of wild animals; the passages should also be strengthened

(5) Rough handling of ewes should be arrived

(6) Overcrowding of ewes should be arrived

(7) Ewes should not be driven long distances; during the hottest part of day, they should be brought under shade

(*Contd. on page 30*)

 (Contd. from page 15)

TREATMENT

Inspite of the coming in of so many wonder drugs like penicillin and other antibiotics, unfortunately nothing is so far known to cure rabies, once the disease is established.

When rabies virus, taken from a naturally occurring case in a dog, is artificially inoculated into the brain of a rabbit, it dies in about 21 days. This virus as it occurs in nature is called 'street' virus. When 'street' virus is passed through the brain of a number of rabbits it gets modified, and the animal dies in about a week's period. When a stage is reached at which the period from infection to death does not decrease further, but remains constant, the virus is termed a 'fixed' virus.

A vaccine is prepared by using the 'fixed' virus in the brain of animals like the sheep. Any case of animal bite in animals or human beings, particularly if unprovoked, should be regarded as serious and a qualified doctor or a veterinarian should immediately be consulted, as the case demands. In vaccination, advantage is taken of the long period (incubation period) generally required for the manifestation of symptoms after infection. We vaccinate the bitten animal or human being in the hope that immunity is produced before the incubation period is over.

In this connection, it is necessary to remember that:

(i) The rabies virus may be present in the saliva of a dog up to ten days before the onset of symptoms.

(ii) If it is possible to keep the rabid animal under observation, it should never be killed. If the animal remains in apparent normal health up to 10 days, there is no danger to the bitten person or animal. However, a doctor should always be consulted as early as possible for the advisability of giving anti-rabic vaccine.

(iii) If a dog is bitten by another animal which is rabid or becomes rabid during the 10 days of observation, or has been killed or is untraceable, the bitten dog should prferably be killed. If this is not possible due to some special reasons, the animal should get anti-rabic vaccine immediately and should be considered as dangerous for six months. It should particularly be watched and kept under confinement for the first three months.

(iv) If the mouth of a dog is to be examined, thick leather gloves should be used.

(v) All wounds inflicted by animal bites, and particularly the unprovoked ones, should immediately be thoroughly washed with soap and water. Then the wound should be dried and cauterized with carbolic acid keeping in view that all deep portions of the wound are also properly touched. After application of pure carbolic acid, methylated spirit should be applied to neutralize the excess of acid. If carbolic acid is not available, tincture of iodine will serve the purpose.

(vi) Though there is no danger of infection through an unbroken skin, licking by pet dogs should always be discouraged.

(vii) Consumption of boiled milk of a rabid milch animal or the handling of a dog which has been recently bitten by a rabid animal do not call for any treatment, unless of course, if some wounds on any part of the body are known to have been definitely smeared with saliva.

(viii) Clothes soiled by a rabid animal need not be destroyed. Soaking such clothes in strong phenyl or lysol lotion and drying them in the sun is enough to destroy the rabies virus.

PREVENTIVE MEASURES

The following measures will help in the control of rabies in our country:

(i) Ownerless street dogs should be destroyed as far as possible.

(ii) All pet dogs should be kept immunized by regular use of anti-rabic vaccine. A single dose of the special vaccine inoculated every year produces a reasonably good immunity.

(iii) Registration and licensing of dogs should be enforced and vaccination should be a prerequisite to registration.

(iv) All dogs bitten by rabid dogs should be destroyed. If impossible, the bitten animal should be vaccinated at once and kept under observation for six months.

(v) Health authorities should be notified of any affected and suspected cases.

(vi) Jackals should be destroyed as far as possible in cooperation with the Forest Department.

(vii) Mass education on the seriousness of rabies should be undertaken.

CONTRIBUTORS ARE REQUESTED

to kindly submit two copies of all articles, notes, etc. intended for publication in "Indian Farming". The articles should be clean-typed in double space on one side of paper, leaving a sufficient margin on the left-hand side. Contributions may be addressed to the Editor, "Indian Farming", Indian Council of Agricultural Research, Jamnagar House Hutments, Mansingh Road, New Delhi 2.

MEN OF THE MONTH

(*Contd. from page 6*)

Mr. Joseph breeds his own strain, taking care that the fittest birds are selected. He prefers birds two to three years old and does not include in his breeding pen the birds that have been sick even once. The birds kept by Mr. Joseph produce eggs of first class quality too and have won for him several prizes on that account. He is a voracious reader of literature on poultry, both foreign and Indian, and maintains a good library on this subject.

JOSEPH INSPIRES JOHNSON

Mr. Joseph's brilliant success in the art of poultry-keeping has inspired another colleague of his, Mr. A. N. Johnson, who is his neighbour. Mr. Johnson came over to Ajmer, attracted by the scenic beauty of this ancient city, in search of a job after doing his M.Sc. from the Agra University, in 1941. The interest in poultry-keeping then prevailing in Ajmer lured him to this hobby. But the real incentive was provided by his neighbour, Mr. Joseph. The birds that Mr. Johnson reared up were of such fine quality that drew appreciative remarks from a seasoned poultry-keeper like Mr. Joseph, who advised him to enter his birds in the Jaipur Show. Mr. Johnson sent eight birds to the show to compete and it was remarkable that he could win as many as seven prizes. Encouraged by his success Mr. Johnson became more enthusiastic about poultry-keeping, became a member of the Indian Poultry Club and participated in discussions on poultry with the other members of the Club as well as the local poultry officers. In this way he acquired much useful information about the various aspects of poultry-keeping. Besides, Mr. Joseph was there as his constant adviser and guide.

Mr. Johnson first took to the rearing of Rhodes but in 1946, he changed over to a different breed altogether, the White Leghorns. "This I did merely to avoid competition from seasoned poultry-keepers of Ajmer who were all patrons of the Rhode Island Red breed." But as ill luck would have it, Ranikhet disease broke out among his flock, practically wiping it away, and only four females survived the attack. To this depleted number he added one male purchased from the Mission Poultry Farm, Etah, and took these five birds to the All-India Poultry Show held for the first time along with other poultry-keepers of Ajmer. Only the male got a first prize. After returning from the Show, he took to breeding seriously and, thereafter, won a large number of prizes, including 24 out of a total of 86 prizes distributed at the All-India Show held in 1952.

Mr. Johnson attributes the good health of his poultry to a liberal supply of green feeds to them. He also gives them grit containing a good percentage of calcium in it as this imparts that lustre and hardness to the shell which is a characteristic of eggs of good quality.

Mr. Johnson is all praise for poultry-keeping, which he said had made meat and eggs a major item in their daily menu. According to him, the birds are generally self-supporting and in addition, they provide nourishing food to the family.

BUILDING UP A BETTER EWE FLOCK

(*Contd. from page 27*)

(8) They should not be allowed to jump over hedges or ditches

DURING LAMBING

Lambing may occur in the pens or in the grazing field. If any ewe lambs in the field, the shepherd must keep a very careful watch over her. Otherwise, there will be every chance of such ewes being left behind and getting lost in the grazing areas in the evening. An ewe normally takes about an hour to lamb after the first appearance of the water bag. A few hours before lambing, an ewe is disinclined to feed, is restless and tries to seclude itself from the rest of the flock. There is a slight swelling of the genitalia, with a slight flow of mucous from the vagina. No special care or assistance is ordinarily necessary. If an ewe has been found straining for a long interval, say for two or three hours, and the lamb does not come out, however, ready veterinary aid should be provided.

After the lamb has been born, the ewe and lamb should never be separated at least for 24 hours. After that, the lamb may be retained in the pen and the ewe allowed to go out for grazing daily. For about a month the ewes must be brought back to the pen for an hour at noon to suckle their lambs.

GENERAL MANAGEMENT

A proper care of the ewes should include dosing them for worms, and a regular dipping given to them for external parasites.

Phenothiazine is quite an effective remedy for internal parasites. In the absence of phenothiazine, the following worm mixture may be administered in doses of 2 to $2\frac{1}{2}$ ounces accroding to age and size:

Copper sulphate	8 ounces
Powdered mustard	4 „
Water to make up	3 gallons

The solution must be freshly prepared and great care exercised to see that no particle of copper sulphate remains undissolved.

All ewes must be dipped four weeks after each shearing to free them from external parasites like mites, lice and ticks. Any patent sheep-dip may be employed for the purpose, but it is always desirable to avoid arsenical dips to prevent any likelihood of inadvertent poisoning of animals or men in the locality.

The blow-fly menace should be minimised by crutching and by applying fly repellants. For preventing attack by the sheep nasal-fly the nostrils may also be smeared with *neem*-oil.

Ewes of unusually small size, those with diseased udder and those which do not breed regularly must all be culled from time to time.

If the farmer pays attention to all these details, he can confidently hope and look for better returns from his flock of ewes.

FEEDING DAIRY CATTLE - - - - - -(*Contd. from page 22*)

including shark liver oil in the feed.

Cows get vitamin A in the form of carotene, which is mostly obtained through green fodder. A part of this carotene is converted into vitamin A and is found in milk-secretion. The vitamin-content varying with the quantity of carotene taken in milk is a good source of vitamin A, and it would naturally be desirable that milk contains vitamin A in sufficient quantities all the year round. However, since under our conditions green feed is not available during certain months, the quantity of carotene taken in by the cow is limited, and hence her milk during that period contains very little vitamin A.

Cows and buffaloes fed with ten grams (200,000 international units) of shark liver oil per head per day along with the dry roughage during the dry fodder period of 4½ months, gave milk with a high vitamin A content. The maximum average total vitamin A potency was 1,066 international units per pound of milk in the case of the cow, and 1,155 units per pound in the case of the buffalo. The flavour of shark liver oil was not noticed in the milk. These values compare favourably with those for milk of cows and buffaloes receiving plenty of green grass.

EDITOR'S PAGE - - - - - - - - - (*Contd. from page 3*)

of nine months only, while those of 1952 the entire year of 12 months. The greater consumption of the fertilizer in 1953 is revealing and it would be safe to assume that this was a direct result of the campaign and it went into the production of paddy by the improved method. If that is so, the fact is itself an eloquent testimony to the success of the campaign.

The success of this campaign was mainly due to its planning and organization. The plan followed in publicising the Japanese method of rice cultivation should appropriately be looked upon as a model for any such campaigns contemplated to be undertaken in future.

INDIAN FARMING

Vol. III New Series No. 12 Mar. 1954

EDITOR'S PAGE AND EDITORIAL NOTES 2
MAN OF THE MONTH (Feature Article)—P. U. Oza 4
THE GREASY CUT-WORM 'AGROTIS YPSILON' ROTT.—A SERIOUS PEST OF RABI CROPS—E. S. Narayanan 8
FIGHTING FAMINE AND DROUGHT BY SIMPLE MEANS —S. B. Singh and Ram Krishan 11
POULTRY-LICE—P. Balarama Menon 12
SUGARCANE IN WEST BENGAL —M. P. Guha 14
CALF-RAISING—J. D. Sampath Kumaran 16
PRODUCTION OF CHILLIES —S. S. Purewal 20
COMPARATIVE PERFORMANCE OF SOME OF THE NON-LEGUME FORAGES IN THE PUNJAB —H. C. Malik 25
HARVESTING AND PREPARATION OF GROUNDNUTS FOR MARKETING IN MADHYA PRADESH —S. G. Kolte 31

★

EDITORIAL BOARD

Printed and published by P. H. Raman at the Associated Advertisers and Printers Ltd., 505, Arthur Road, Tardeo, Bombay 7.

(Agents for Indian Council of Agricultural Research, New Delhi.)

ADVERTISEMENT RATES

CURRENT:
CASUAL

Full Page	.. ..	Rs. 450/-
1/2 Page	.. ..	Rs. 225/-
1/3 Page	.. ..	Rs. 150/-

CONTRACT CONCESSIONS:

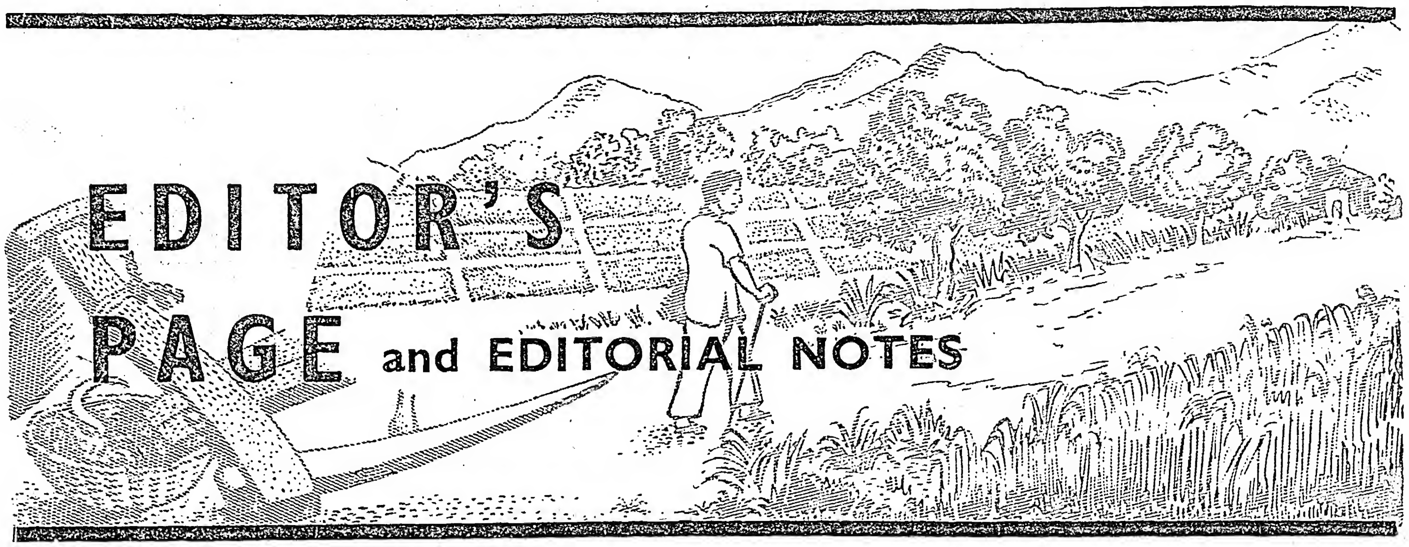
6 INSERTIONS	12 INSERTIONS
Rs. 400/-	Rs. 350/-
Rs. 200/-	Rs. 175/-
Rs. 135/-	Rs. 120/-

Effective from October 1952 until further notice.

SUBSCRIPTION RATES

Annas 12 only per copy
Rs. 9-0-0 for 12 issues
Rs. 4-8-0 for 6 issues

All Business enquiries may be addressed to the "Agents" at 505, Arthur Road, Tardeo, Bombay 7.



I. C. A. R. RESEARCH PUBLICATIONS

It is accepted that research should be constantly carried out in order to evolve new techniques to help the farmer to increase production. The results of these researches form the material which is the basis of extension work. That being so, the results of these researches, their methods, their details and the conclusions drawn from them should be easily and generally available. They should be available for two purposes—first to acquaint the person who is carrying on research with the latest developments in his particular subject or project of studies, and secondly to offer material to the extension writer so that the technique evolved or the results achieved may be available to the farmers in a language or in a manner which they can appreciate and understand.

Thus the research publications are concerned only with reporting the scientific aspect of any research project and the results obtained therefrom. It does not necessarily mean that only positive and helpful results of research should be published. In many cases the published literature may relate only to methods or technique for carrying out a particular research project, and in other cases it may even report negative results of research. Even a negative result is helpful so that the particular technique or formula or methods may be avoided by the farmer.

Since research publications form the basis of all extension information, it is necessary that the research journals and publications are maintained at a proper standard of dependability in respect of research work reported therein. The research work reported should be factual and only logical conclusions, uninfluenced by the personal inclinations of the research workers, should be incorporated. Then only the material could be properly utilized by extension writers for useful purposes.

Research publications by their very nature have a limited appeal and only technicians, research workers and workers in experimental stations can benefit by these publications. They are not meant for the village level workers or the actual farmers for their day to day work.

The Indian Council of Agricultural Research has been issuing a large number of research publications. The research publications can be broadly divided into two groups: (i) regular publications and (ii) occasional publications.

Under the regular publications may be grouped the research journals which are brought out at fixed intervals of time containing technical papers reporting results of research. There is one journal devoted to research in agricultural and allied sciences known as the "Indian Journal of Agricultural Science"; this was started in 1931. The other is devoted to animal husbandry subjects and is named as the "Indian Journal of Veterinary Science and Animal Husbandry." This includes research articles on animal nutrition, dairy science, animal diseases, etc. in addition to those

on purely animal husbandry subjects. This was also started in 1931.

The occasional publications are the monographs, bulletins, pamphlets in the research series and in the review series. The monographs contain an extensive treatment of a particular subject so as to form an all-inclusive self-contained book. The bulletins are less extensive and are confined to a particular aspect of a subject. The research pamphlets contain results of investigations which are more or less complete and review pamphlets, contain an up to date exposition and assessment of literature on a particular subject. In addition, there are other *ad hoc* publications issued from time to time.

The materials for these journals are mostly drawn from research workers in the fields of agriculture and animal husbandry either in the Central or State Research Institutes, or in agricultural colleges or even universities and private research institutions. The Indian Council of Agricultural Research subsidises throughout the country a large number of research projects; the data and other information obtained from these research projects form, in many cases, the basis of the articles included in the research journals. The research articles are written by the persons who have undertaken the research or are in charge of the research work. Similarly, the monographs, bulletins, research and review pamphlets are written by competent persons specially qualified to write on the particular subjects. Since they are written by competent authorities, these publications are looked upon as authoritative pronouncement on the particular subjects they deal with. And, therefore, the extension writer who culls out materials from these publications stands on a sure ground that the information he is passing on to the farmer is tested, verified, correct and dependable.

★

CORRECTION

January, 1954 issue of "Indian Farming"

In the block showing the candling appearance of eggs printed on page 17

For the caption at the top, i.e.
Fresh egg (Candling appearance)

Read Developed embryo (Candling appearance)

For the caption at the bottom, i.e.
Developed embryo (Candling appearance)

Read Fresh egg (Candling appearance)

MAN OF THE MONTH

Initiative and Help Produce 'Bajra' Crop

Farmer Bhadabhai

By P. U. OZA

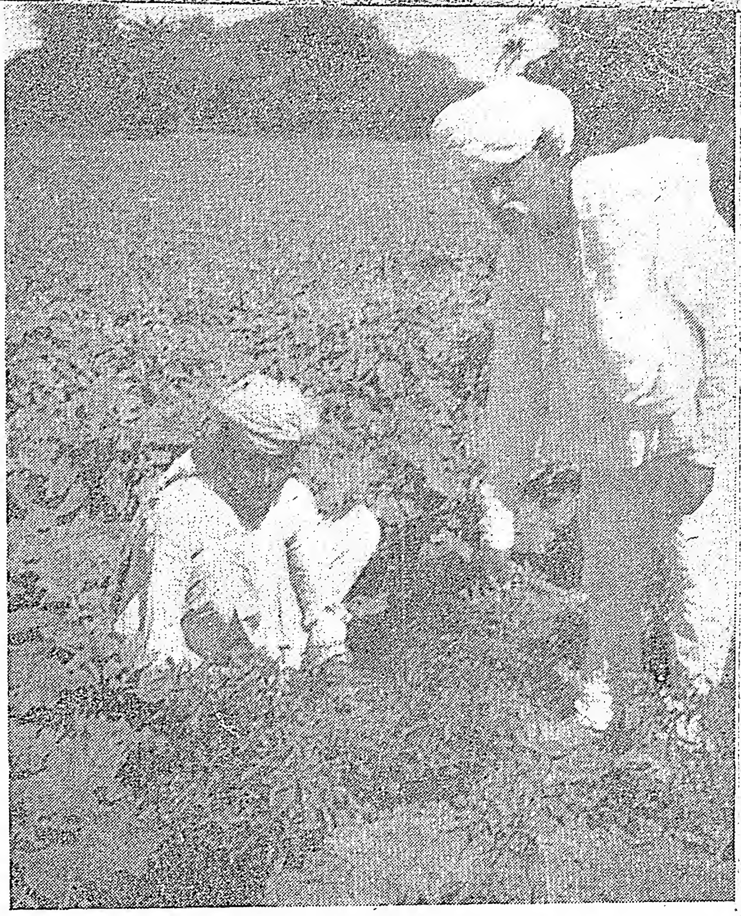
WHETHER it is chain reaction to the recent campaign on Japanese method of paddy cultivation or growing awakening sweeping the countryside or a combination of both, I cannot say. Nevertheless the fact remains that at a number of places, some cultivators have, on their own initiative, experimented with different crops, following several features of the Japanese method and a few steps of their own formulation and have succeeded in producing remarkably high yields from their fields.

It is known all over that the two basic factors which lead to better yields are water and manures. Recent attempts by the Union and State Ministries of Agriculture in systematizing cultural practices in a number of crops, notably paddy, are beginning to yield encouraging results. Reports have been received of cultivators getting high yields in *jowar*, in *bajra*, and other crops by carrying out certain experiments on their own initiative and using a bit of imagination. It is to such cultivators that the country owes its present happy position regarding food situation.

A NEW METHOD AND UNHEARD OF YIELDS

One such cultivator is Bhada Bhima Kotadia of Mota Gundala in the Jetpur *taluka* in Saurashtra. For over 250 years the Kotadia family has raised groundnuts and *bajra* on a farm of 20 acres. The crop rotation records show that in this area a number of crops like *bajra*, wheat, *jowar*, and in recent days, rice have been taken but the yields have not been very satisfactory. The average *bajra* yield in this area has been 15 maunds per acre. As against this Bhadabhai was successful in getting 76 maunds on an acre, a record yield for that particular area.

Imagination Bumper



The typical farm-labourer with the owner

However, it is not the yield that matters in this particular case. What matters is that this farmer having been told about certain experiments carried out in Charota area of Gujarat decided to try this method which has been given the name of the Russian method, mainly because the experiments were based on an article appearing in a Gujarati daily of Ahmedabad, giving a vivid description of how a Russian farmer obtained a remarkably heavy yield of *bajri*.

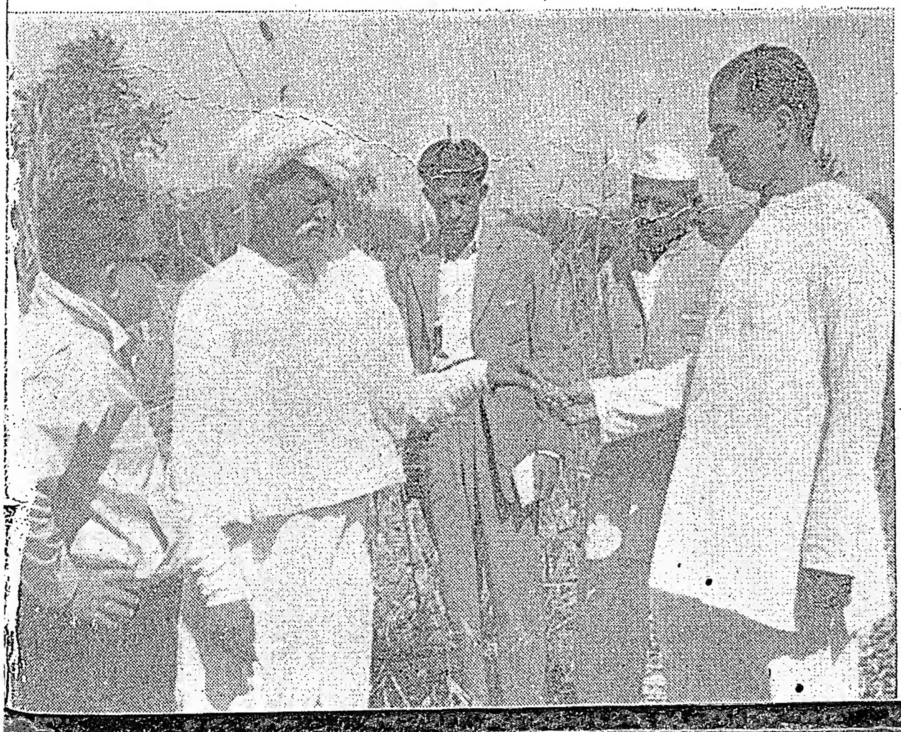
STEPS TO HIGHER YIELDS

The method as described by the Saurashtra Agriculture Department has a number of features which call for almost garden conditions in *bajra* cultivation. In short, the main features of this method are:

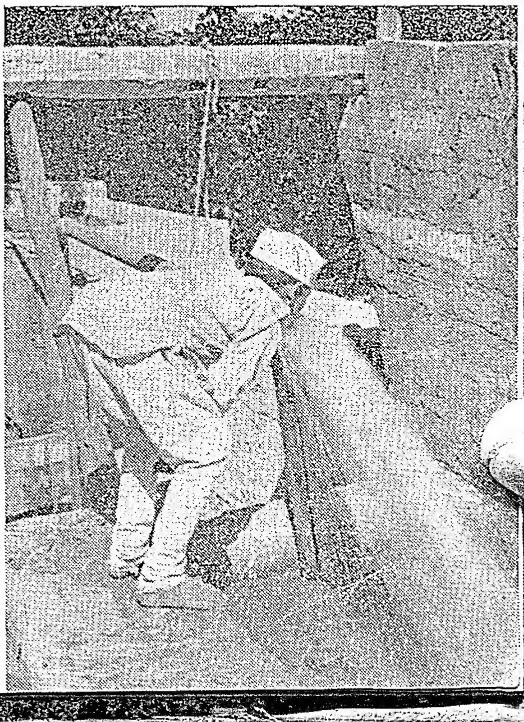
(1) One irrigation is given to the field during the first week of June.

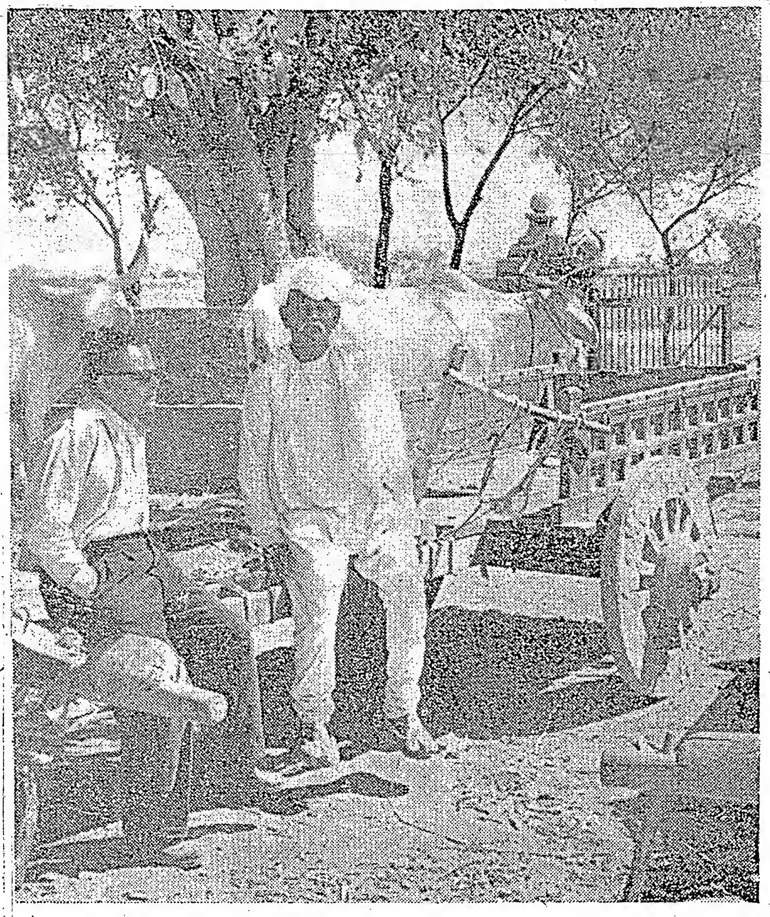
(2) After one week, twenty cartloads of farmyard or compost manure and 200 lb. of superphosphate per acre are spread followed by a second ploughing, after which harrowing and levelling is done. Three more ploughings followed by harrowing and levelling are also given.

Farmer Kotadia shows a poorly ear-head to Extension Centre Principal



Well-water irrigates the land; thanks to a pump-set





Farm entrance—a typical Saurashtrian village scene

(3) When the field comes to a very fine tilth, it is marked in both directions by drawing a *dantal* with prongs 18 in. apart. At the places where these lines cross, *bajri*-seed is dibbled putting five to six grains per hill and covering it with fingers.

(4) The sprouts appear within four to five days time. Interculturing is done as in wheat. During the third week top-dressing of a manure-mixture containing groundnut cake eight parts, ammonium sulphate one part and superphosphate one part, is given around each hill, the rate being 200 lb. per acre.

(5) When the crop is about three to four weeks old, a wooden plank is drawn on the standing crop. When the crop resumes natural position, as a result of the stimulus, the plants produce profuse tillering. Hoeing is continued and done as often as possible.

(6) Just before flowering, the second dose of manure-mixture is given as top-dressing and mixed with soil by *khurpi*. If there are no rains, and there is a shortage of moisture, one irrigation is given after the application of second top-dressing.

(7) The harvesting is a continuous process in that ear-heads are harvested as they go on ripening and not all of them at a time. The ear-heads on the main stalks ripen earlier than those on the tillers.

(8) Compact and big-sized ear-heads from a uniform growth of the mature crop are preserved for seed purposes. The main principle to be observed in irrigating *bajri* crop is that when marked effect of want of moisture is visible, then only water should be given.

An interesting observation made by the Taluka Agricultural Officer was that the *bajri* crop raised experimentally after following the above instructions had previously given yields up to 2,500 lb. per acre. Even under rain-fed conditions, crops have given yields up to 800 lb. per acre as against the over-all average of 200 lb. per acre under the Saurashtra conditions.

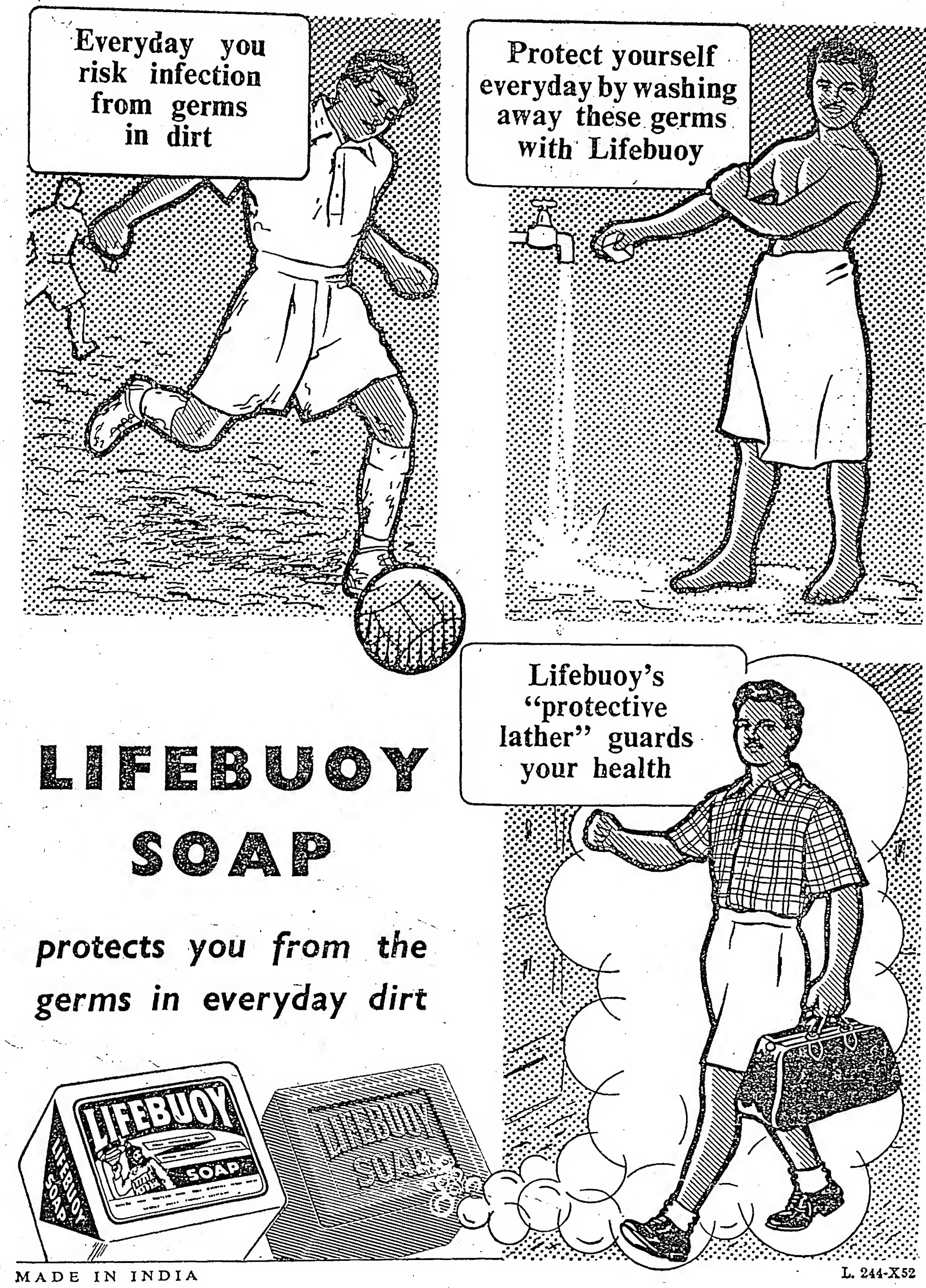
A NOBLE IDEA

On being asked why is it that he started this experiment on his own farm, I was told that the village of Mota Gundala wants to manage its own economies and is prepared to try any developmental programme to ensure that the collective income of the village increases. Otherwise, almost inevitably the villagers get into debts unless they marched with the times. This was a noble point of view and on an enquiry I found that the villagers have not to run after credit facilities. They try to progress on their own, slowly perhaps, by adopting improved techniques within their own means. Manure consciousness and an appreciation of the use of improved seeds was evident in this village and, as one of its leading farmers, Bhadabhai decided to give a lead by experimenting with this new method. Having a pumping set which irrigates his fields, dry periods normally do not bother this sturdy old farmer of 62. But for the failure of the set which prevented adequate watering of the crop during the dry spell preceding the ripening of the crop, he would have easily obtained much higher yield, more than the one reported. The experiment was carried out on one acre out of a 20-acre farm, but for the ensuing season he contemplates to spread this out on five additional acres, thus gradually enlarging the scope of his operation.

I was given an insight into the working of the minds of the villagers when we sat down to exchange views over a glass of milk. The farmers who had gathered round had stories to tell about how the village had come into being. They were proud of detailing how they were justifying their existence by successfully trying a new method whereby one of the leading farmers of the village got the highest *bajri* yield in Saurashtra. Some of the salient features brought out during the discussion showed that the experiment which was encouraged by the Assistant Agricultural Officer has succeeded beyond expectation. The second experiment was washed away due to incessant rains which this area had not experienced in recent times.

During the rainfall the village was completely cut off from outside world and the villagers have been clamouring for a causeway to be built over the nearby river to connect it to Dhoraji, a nearby district town. The village consisting of 1,500 persons with about 400 farms and 50 to 60 wells has a *panchayat,* a school, and a mutual help system whereby the financial needs of any one inhabitant, whenever such a necessity arises, are met from the resources of the others in the village. Thus as I stated earlier, the village is not indebted to any outside agency. Farmer Kotadia, who is also the village *patel,* has two sons Mandan and Natha, aged 32

(*Contd. on page 27*)


Everyday you risk infection from germs in dirt
Protect yourself everyday by washing away these germs with Lifebuoy
Lifebuoy's "protective lather" guards your health
LIFEBUOY SOAP
protects you from the germs in everyday dirt
LIFEBUOY SOAP
MADE IN INDIA
L. 244-X52

SEASONAL PESTS OF CROPS:

THE GREASY CUT-WORM *Agrotis Ypsilon* ROTT.— A SERIOUS PEST OF *Rabi* CROPS

By
E. S. NARAYANAN,
Head of the Division of Entomology, I. A. R. I., New Delhi

As in all the highly developed animal groups, in the case of insects also we come across various kinds of characters like the weak, the beneficial, the aggressive, the brave, the cunning and the cowardly. To the last category belongs the cut-worm, *Agrotis ypsilon* Rott. whose caterpillars hide themselves in the soil during the day and prowl at night, committing acts of vandalism on the young and tender plants under cover of darkness. These caterpillars not only feed themselves on the plants, which in itself is bad enough, but also destroy the tender plants by cutting at their roots. The damage caused by them is indeed very great sometimes.

In our country, the cut-worms are usually the major pests of gram, although at times a number of other *rabi*-crops are also attacked by them. Of the recorded species causing some kind of damage or the other in the Indian Union, *A. ypsilon* is undoubtedly the most widely distributed and also the most serious one. The pest has been reported from almost all the regions of northern India forming a continuous belt from the Punjab in the west to Bengal in the east and Madhya Pradesh in the south stretching as far as Nagpur. The *tal* areas near Mokameh in Bihar are the most seriously affected areas. Here the pests live and multiply by hiding themselves in the soil left moist by the receding flood-waters of the river Ganga, and destroy annually *rabi*-crops worth several lakhs of rupees. The cut-worms love a moist soil and drought is their dreadful enemy. The portion of the Gangetic plains of north India lying parallel and close to the Himalayas, seems to be their chosen abode. Outside India, the pest has been recorded from East Pakistan (Jessore and Rangpur) and West Pakistan (Lyallpur), North and South America, Europe, North Africa, Egypt, Japan, China, Tibet, Ceylon, Java, Australia, New Zealand and Hawaii. In some of these places it is popularly known as the black cut-worm.

Besides the gram crop which is severely infested year after year by this species of cut-worm, it has also been observed causing extensive damage to the other *rabi*-crops, especially those that are grown on lands that remain under water during the rainy season. The pest has been found to cause damage to gram, groundnut, sweet potato, cauliflower, cabbage, lucerne and wheat at Pusa (Bihar), to gram at Gaya, to opium at Sahabad, to clover at Nagpur, and to potato at Jabalpur. Valuable leguminous crops like *masur*, *khesari* and peas growing in the *tal* or flooded areas in Mokameh on the banks of the Ganga in Bihar, suffer severely from the depredations of this pest year after year. Very recently the pest has been reported to be causing extensive damage to the potato crop as well as tubers at Patna, so much so that it is now believed to be a major pest of potato throughout the Indian Union. At the I.A.R.I. farm at Delhi and in the cultivators' fields in the Delhi State, the pest has been observed to infest gram, potato, tobacco and mustard, and vegetable crops like cabbage, cauliflower, etc.

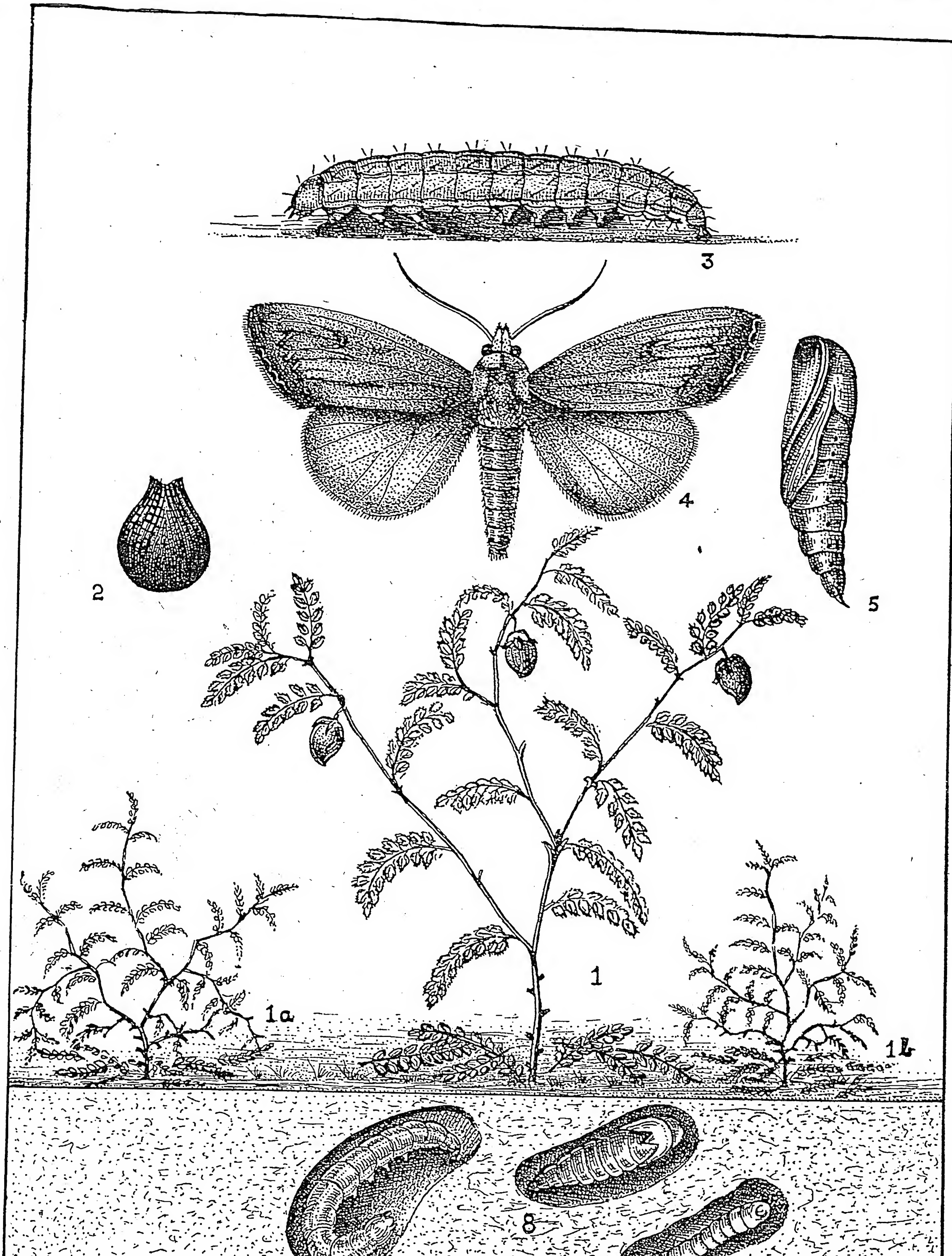
HABITS AND HABITAT

Though the moths can be found in the field even in the beginning or middle of October, they appear in large numbers from November onwards only. The peak period of their activity lasts for four months, from December to March. During these months the caterpillars are found in large numbers and severely damage the tender *rabi*-crops that have sprouted and grown to a height of about six inches or more. During the day time moths hide themselves under dried twigs and leaves or in the cracks in the soil. When they are touched they feign death. If disturbed they shoot forth to another dark corner or a suitable hiding place by characteristic jerky movements. When at rest during the day their legs and wings are held close to the body. During the night, however, their wings remain horizontal and not applied to the body as in the day time. Also the body is as much above the ground as the legs can raise it.

As soon as twilight sets in they come out of their hiding places and fly about in the field till it is completely dark. Then they start laying eggs on the host plants. Eggs are usually laid on the under surface of leaves or parts of stem which lie close to the ground. In *tal* lands near Mokameh the moths have showed marked preference to lay eggs on wet or muddy lands just after the flood water has reced-

"AGROTIS YPSILON" Rott.

1, 1a and 1b. Gram plants showing damage by the cut-worm 2. An egg 3. The caterpillar 4. The pupa 5. The moth 6. A caterpillar hiding itself during the day time 7. A larva pupating in the pupal chamber underground 8. The pupa underground


3
4
2
5
1
1a
1b
8
6
7
P. Sahadevan

ed. Indeed they have been observed to fly long distances to reach the end of their journey, this favoured spot and their haven. A single female moth is capable of laying as many as 30 eggs at a time on a particular spot, and has been observed to lay as many as 350 eggs during her lifetime. Usually the eggs are laid singly or in small scattered groups. The egg is minute, pretty and dome-shaped, creamy white in colour and about half a millimeter wide from one side to the other. As it develops the creamy white colour changes to a dull hue with a blackening at the top where the head of the developing caterpillar is located. The incubation period of the egg varies from about two days in the summer to about nine days during the winter months.

A peculiar habit of the freshly-emerged larva is that it has for its first meal the egg-shell from which it has emerged. Initial appetite thus satisfied it goes in search of its food. The newly-hatched larva is about 1.5 mm. long and is light yellowish-grey in colour. The young and the grown up caterpillars have got the peculiar habit of coiling themselves on the slightest touch and feigning death. For some time the young larva feeds upon fallen leaves on the soil or leaves that touch the ground. It has to pass through six stages before it becomes full-grown, when it measures about 1.75 inches in length. The full-grown larva is dark or dark brown in colour. These attack and feed themselves on the standing plants and often cut the plants at their roots. They remain hidden in the cracks or holes in the soil at a depth of about one inch during the day and assume the colour of the soil in which they hide and thus escape being noticed. They come out of their hiding places at night for the sole purpose of feeding themselves. It has been observed that sometimes after filling their stomach they carry some of the cut portions of the plant into their abodes. It is, therefore, not surprising that cannibalism should exist among the members of this greedy group characterized by excessive appetite. Young larvae are often attacked and consumed by the older ones and the older ones fight battles among themselves, and those that are defeated are mauled and eaten up. The larval period lasts for about a month and when it is very cold the duration is a few days more. In summer the larval period is shortened by several days. The full-grown larva pupates underground. The pupal period varies from about 10 days in summer to about 30 days in winter. The pupa measures about 20 mm. in length and is red brown in colour. Moths emerge from these pupae lying underground and crawl out of the tunnel that the larvae instinctively prepare while going underground to pupate. The moths mate soon after emergence and the female starts oviposition four to five days after its nuptials. The total life-cycle of the pest varies from one to two months according to the climatic conditions. Two broods have been observed during the peak season. The second brood is more aggressive than the first one and is responsible for more damage and destruction. During the lean days of rains and summer the pests lie and live scattered in weeds growing in waste lands and begin their normal activity with the advent of winter.

CONTROL MEASURES

The control of the cut-worms and particularly of *Agrotis ypsilon,* which is polyphagous by habit, is one of the most difficult problems that have to be faced. As the caterpillars always remain underground and choose moist earth as their abode, their incidence and abundance can be controlled to a great extent by breaking up the sods in the fields to be sown. Particularly in low lands that are annually flooded by the swollen rivers, as in Bihar, ploughing the fields, say four to five times before sowing, will reduce the incidence of the pest to a very great extent. Flooding the areas that are suspected to harbour a large number of pests may also be useful. By this simple agricultural operation not only are many caterpillars killed by drowning, but also a large number of them comes to the surface where they fall victim to birds, parasites and predators. Clean cultivation and early ploughing of the fields that are going to be sown with *rabi*-crops, will give really

(*Continued on page 32*)

FIGHTING FAMINE AND DROUGHT BY SIMPLE MEANS

By S. B. SINGH, Director of Agriculture and RAM KRISHAN, Assistant Development Commissioner (Agriculture), Uttar Pradesh

THERE are vast areas in Uttar Pradesh which are very deficient in rainfall. As a result the crop yields in these areas are very low and the people are poor and under-nourished. Besides, partial or total crop failures have also been often occurring in various parts of the State, such as the eastern districts, for the last many years due to inadequate and unequal distribution of rainfall. Such failures of crops result in famine conditions and leave the population in a precarious state.

The failure of crops can be avoided by resorting to certain practices of farming evolved after years of research and experimentation. The main object of adopting these practices is to conserve carefully whatever little amount of rainfall is received for plant growth. Normally, a lot of rainfall water either runs off from the fields or is evaporated and is thus lost to the plants. It is, therefore, desirable to reduce or completely stop this drain by retarding the speed and reducing the quantity of the run-off water and allowing it to percolate into the lower layers of the soil for being utilised at later stages of plant growth when there is deficiency of moisture. This can go a long way to help fight famine and drought to a great extent.

LEVELLING AND BUNDING OF FIELDS

The levelling and bunding of the fields before the rains set in is one of the most important practices recommended. The uneven land should, as far as possible, be levelled before bunding. For bunding, the land should be divided into small plots, say of ½ to ¼ acre, each having bunds about one to two feet high. These bunds can be easily prepared with the help of spades or mould-board ploughs.

The greater the slope of the land, the larger should be the size of the bunds and lesser the distance between two bunds. The distance between two bunds mainly depends upon the vertical fall in the level of the field, and in general, it is recommended that a bund should be laid down at every one foot of the vertical fall in the level of the field. The height of such a bund should normally be three feet with a top-width of two feet. The bunds are always constructed across the slope and along the contours.

Proper bunding and levelling of the fields check the rain-water from running off. They also help in checking the washing away of soil particles and loss of fertility due to erosion.

(Contd. on page 24)

Poultry-Lice

By P. BALARAMA MENON,
Division of Parasitology, Indian Veterinary Research Institute, Izatnagar

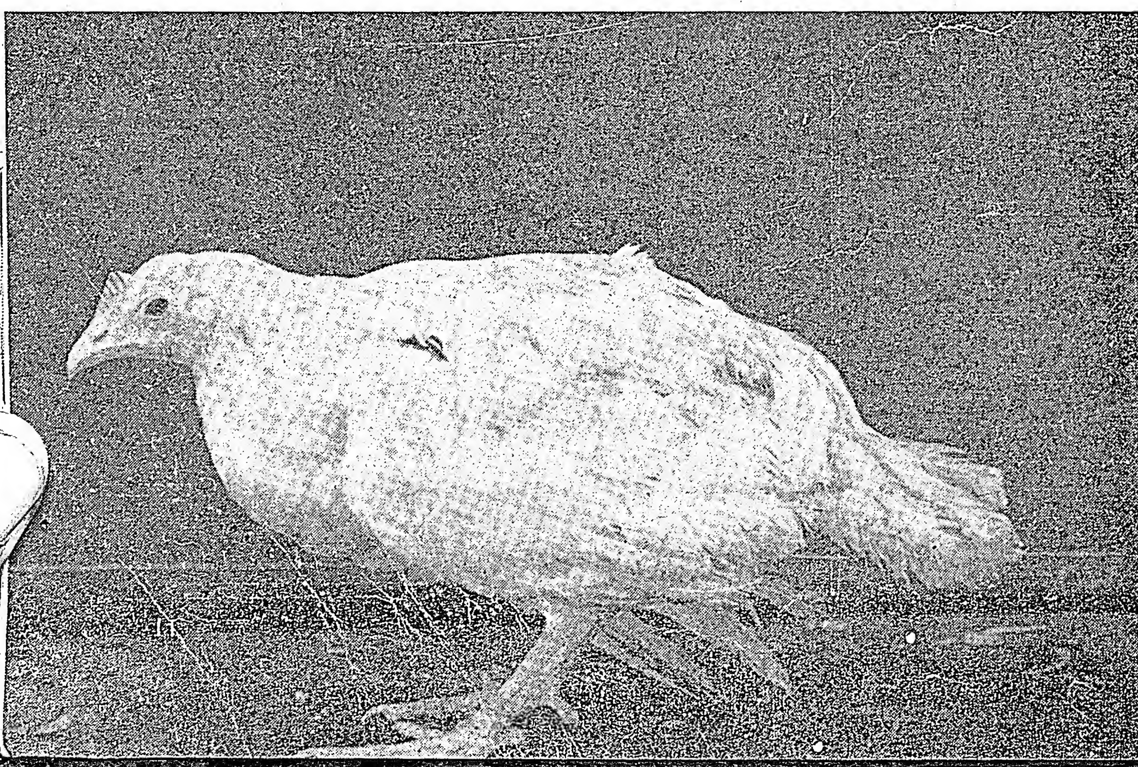
THE estimated poultry-population of the Indian Union consists of 69 million birds valued at 104.7 million rupees. A little less than a third of these birds are laying-hens producing annually 1,341 million eggs valued at 107.3 million rupees. The vast majority of these birds and eggs are in the villages. Thus it is clear that poultry occupies an important place in the rural economy of India. The study of insect pests of the poultry birds, and of other arthropods which play an important part in the transmission, causation and spread of poultry diseases or otherwise affect the poultry birds, is, therefore, of great importance.

The fowl is subject to the attacks of a large number of external parasites belonging to distinct groups, viz. lice, mites, ticks, fleas, flies, etc. The extent of damage caused by these external parasites is not generally fully realized. The attacks by these parasites cause enormous losses and are one of the most important factors operating against the development of the industry. It is obvious, therefore, that we should have an adequate knowledge to enable us to recognise these pests, prevent their attack and control them. We shall only deal with poultry-lice here which are a serious problem to the poultry-breeder as the irritation caused by them makes the bird exceedingly restless with consequent lowering of its condition and egg-production.

THE BITING-LICE

Lice are generally of two kinds—the biting-lice and the sucking lice; only the former are present on birds. The biting-lice have broad heads with mouth-parts adapted for biting and are small, flat-bodied, wingless insects which are permanent ectoparasites, both in the young and adult stages, on birds. Most are swift runners, having claws and hair to enable them to pass rapidly through the hair and feathers of the host. But others are quite slow and cling to the feathers by their jaws. They feed upon fragments of feathers, hair, epidermal scales and the dried blood collecting around wounds of the host. While they do not actually attack the flesh, they become very irritating and are often present in sufficient numbers to cause great discomfort and even death.

The elongated eggs or nits are glued singly on hairs or feathers of the host, and the young appear much the same as adults. They breed under very favourable conditions, having a fairly uniform heat from the body of the host to make them comfortable under most climatic conditions. The broods are over-



A lice-infested bird

lapping, and there are several generations a year.

The injury done by the biting-lice is largely due to irritation or to itching caused by the creeping insects and their incessant gnawing at the skin. This irritation causes the bird to become exceedingly restless, thereby affecting its feeding habits and proper digestion. In addition, the wounds produced as a result of scratching serve as inlets for disease-producing organisms. A badly infested bird is in great distress, becomes restless and consequently emaciated, which predisposes it for the attack of pathogenic organisms. Moreover, egg-production is greatly reduced. A lousy flock of poultry is not a good investment. When lice are abundant uncleanliness and overcrowded conditions usually exist.

LICE INFESTING DOMESTIC FOWLS

More than forty different kinds of lice are said to occur on domestic fowls of which four kinds are commonly found on chickens. Losses due to poultry-lice are most evident among the young birds, but heavy infestations on older fowls result in loss of weight, lowered egg-production and lowered vitality. Though other maladies may present similar symptoms, infested fowls are droopy, with lowered wings and present an unkempt and ruffled appearance, and suffer from diarrhoea. The commoner lice of chickens are (1) the body-louse—a rapidly running species occurring on all parts of the fowl; it is light yellow in colour and about 2 mm. in length; it lays its eggs in large clusters, particularly on the small feathers below the vent; (2) the shaft-louse—which resembles the body-louse very closely but is smaller in size and occurs mainly on the shafts of the feathers; it is said to gain its nourishment from bards and scales of the feathers and is, therefore, not so irritating as the body-louse; (3) the head-louse—a dark greyish species about 2 mm. in length, infesting the head and neck of young chickens to which it is most injurious and (4) the fluff-louse—a very small and broad species about 1 mm. in length, pale in colour and seldom abundant.

CONTROL OF POULTRY-LICE

As in other cases of disease and pest control, prevention is always better than cure. The birds should be kept in houses which are well-lighted, sufficiently ventilated and properly cleaned every day. New birds should always be treated for lice and segregated for at least a fortnight before allowing to mix with the home flock. The breeding birds should be specially attended to as it is through them that lice and other parasites get distributed in the new flock.

Application of sodium fluoride: No remedy has given such uniformly satisfactory results in the control of lice of all kinds on domesticated birds as sodium fluoride. This can be obtained in two forms, a white powder or commercial form (90 to 98 per cent pure) and in fine crystals or chemically pure form. For effective lice-control, the former is preferable. It retains its efficiency almost indefinitely if kept in a dry place in stopped bottles or cans. It can be applied by the "pinch-method" or by means of a salt-shaker type of applicator (old cuticura powder tins suitably modified should serve the purpose). In the former method about ten pinches (amount held between thumb and forefinger) of the chemical are distributed at different parts of the body—head, neck, breast, vent, thighs, wings and tail, and rubbed thoroughly into the feathers. The birds when treated should be held over a shallow pan or newspaper in order that the excess of the chemical may be saved. For dusting, the powdered sodium fluoride can be mixed with three or four times its bulk with flour or talc. This is applied with a dusting-can or shaker and the feathers of the bird are ruffled as this is being done. Dusting involves some wastage of the material and is not so efficient as the pinch method. In addition, the excess material in the air is irritating to the bird and operator both. A mixture of equal parts of sodium fluosilicate and country tobacco-snuff has also been reported to give satisfactory results.

Dipping: If the number of birds is sufficiently large, the affected birds should be dipped in sodium fluoride solution. Dipping is rapidly becoming a standard method of treatment favoured by a majority of poultry-men who have overcome the prejudice against wetting their birds. The solution should be prepared in a wooden tub by dissolving sodium fluoride in tepid water, one ounce to one gallon. Dip

(*Continued on page 27*)

A flock of healthy birds

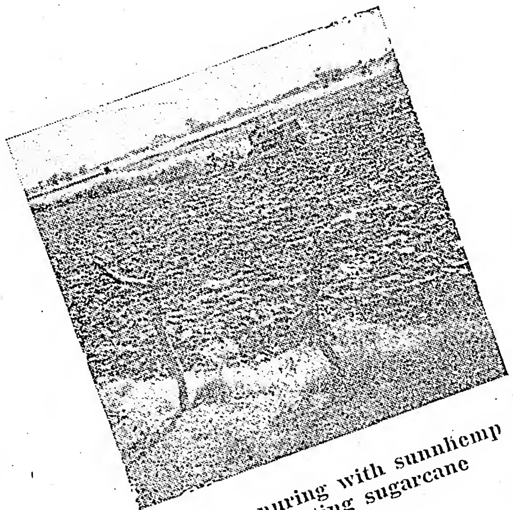
Sugarcane

By M. P. GUHA

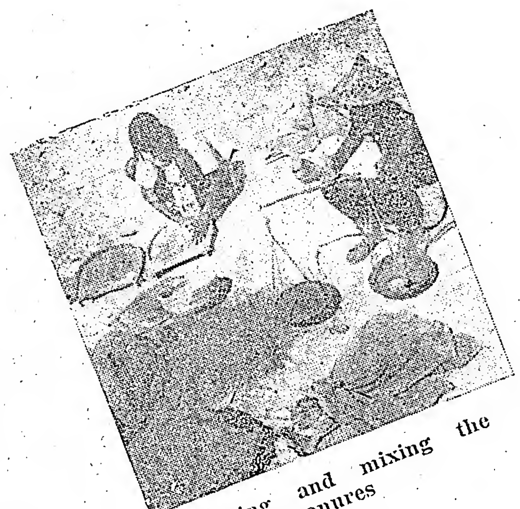
IN West Bengal, the rainfall is not evenly distributed over the whole year. The main sugarcane-growing areas, therefore, need irrigation. This problem has been solved to some extent by the Mor and Damodar Valley Projects and other minor irrigation projects, which have enabled cultivators in the areas served by them to grow two crops instead of one. The irrigation facilities have also enabled cultivators to take to cash crops like sugarcane.

The usual dose of manures for sugarcane used in West Bengal is 100 maunds of cow-dung, four maunds of ammonium sulphate, six maunds of oilcake and four maunds of superphosphate, the last one being not necessary everywhere. In this way, a high yield of over 2,000 maunds of cane per acre has been obtained.

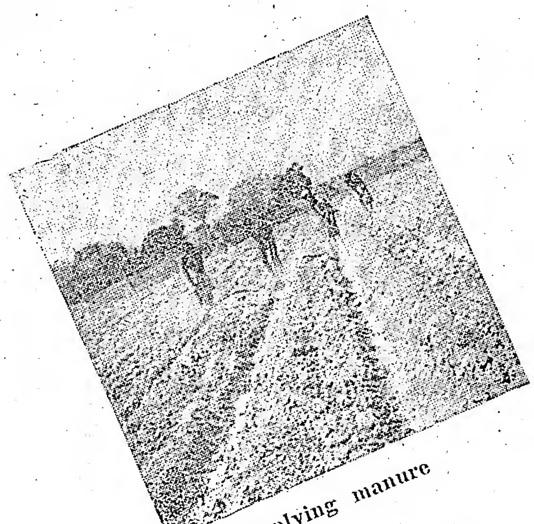
West Bengal is mainly a *gur*-producing area with only one sugar mill functioning in the Nadia district. However, calculated on the basis of a *per capita*-consumption of 15.5 lb. of *gur* in West Bengal, a deficit of 1,15,279 tons of *gur* in the State has still to be made up. Because of the prime need for



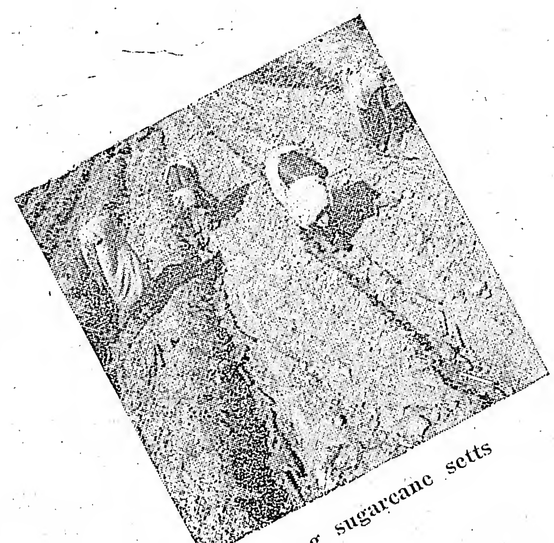
Green-manuring with sunnhemp before planting sugarcane



Weighing and mixing the manures



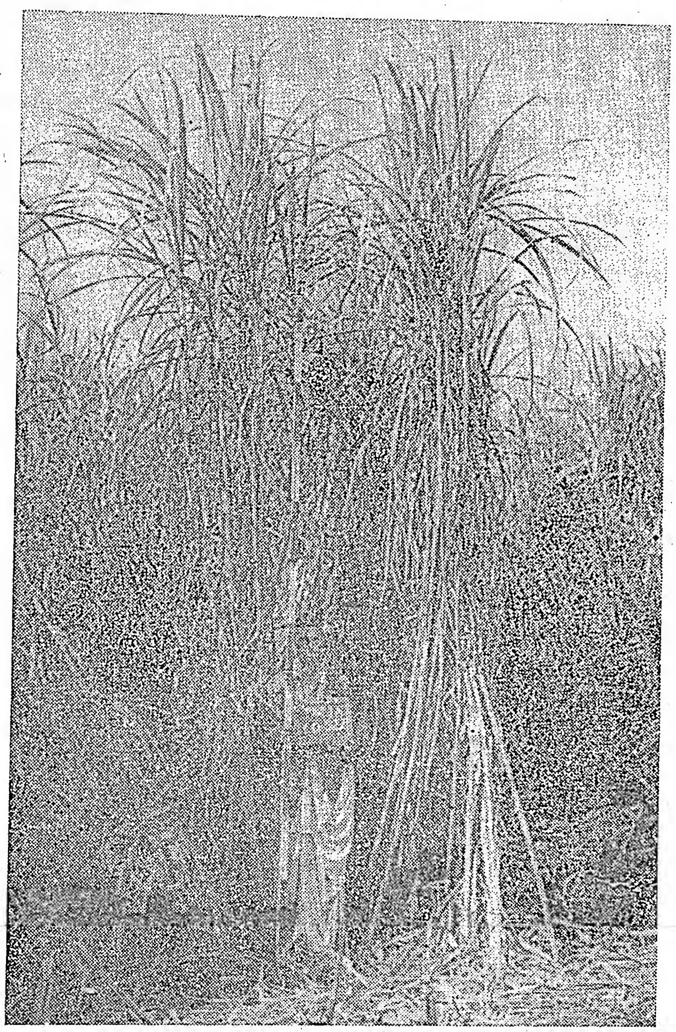
Applying manure



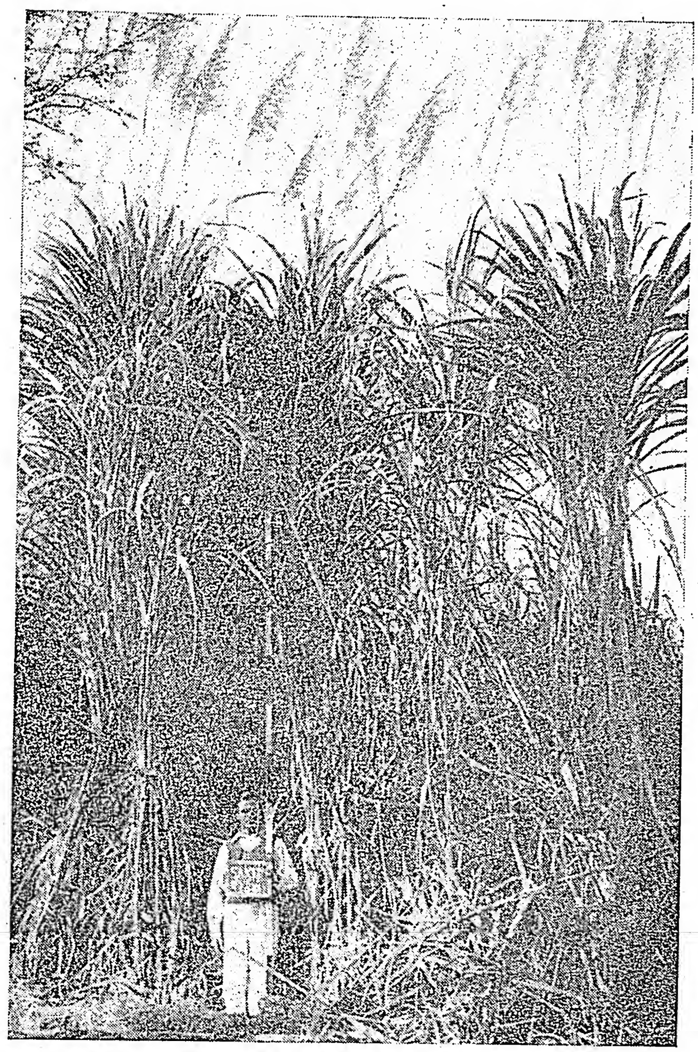
Planting sugarcane setts

in West Bengal

C.O.527 at Palia (Nadia)

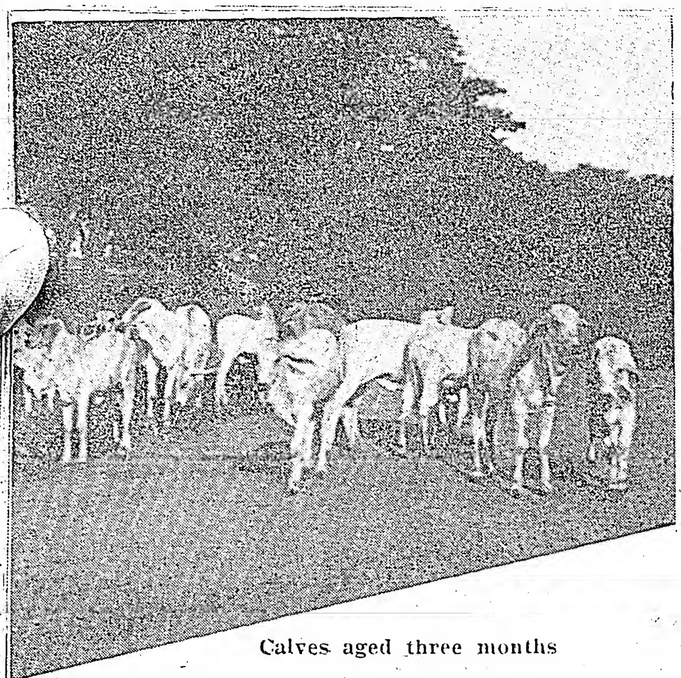


C.O.453 at Saktipur; note the height and tillering

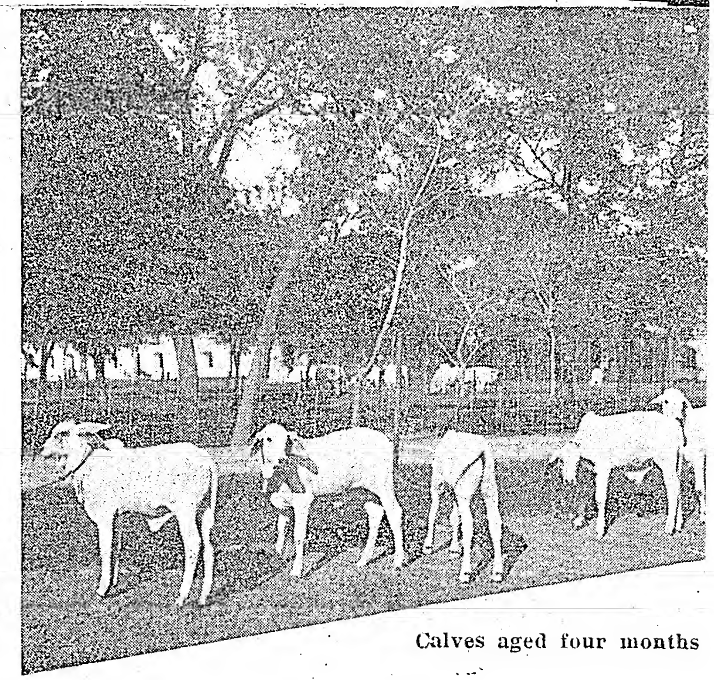


producing foodgrains, only restricted but intensive cultivation of sugarcane is practised. And this has been possible because of the abundant supply of fertilizer now obtainable from Sindri. Activities for pushing up sugarcane cultivation at present are, however, concentrated around the sugar-mill area where the cultivators are being induced to take to agronomic practices.

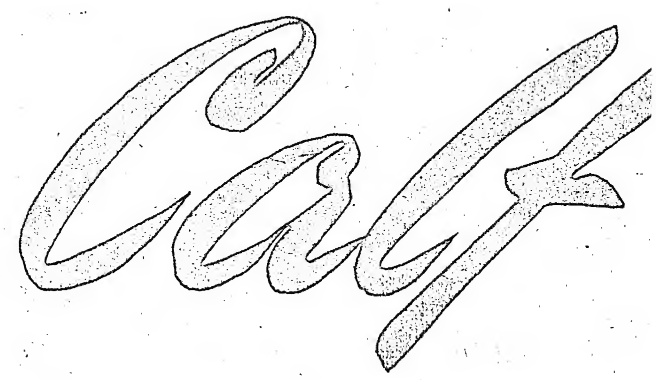
Efforts are also being made to breed a high-yielding early variety suitable to this area. Manurial trials are also in progress on the State Farms at Chinsurah, Berhampore and Burdwan. The cultivators are gradually realizing the value of improved Coimbatore varieties and are increasingly taking to these. Demonstrations are frequently arranged on cultivators' fields to popularize recommended varieties.



Calves aged three months



Calves aged four months



By
J. D. SAMPATH KUMARAN,
Government of India Cattle Farm, Karnal

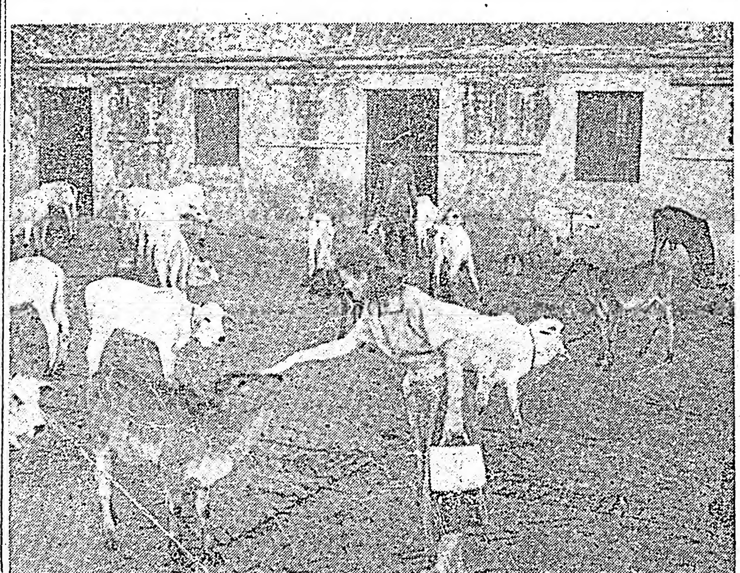
THE economic improvement of a dairy herd could be speeded up by raising dairy calves for the purpose of replacements of the female stock and for the supply of pedigreed young bulls. Generally 20 to 30 per cent of the milking herd must be replaced each year, if the original strength of the herd is to be maintained without making purchases from outside.

When suitable nutritional and environmental conditions are provided there is no limit to intensive production. On the contrary, poor feeding, care and management, either as a calf or as a cow, may prevent a cow from producing a progeny commensurate with her inherited ability. Success depends to a great extent upon the careful raising of dairy calves. The period from birth to the age of calving is a non-productive period with no income to the breeder. In order to develop a superior dairy herd, a careful selection of calves from high-producing cows and families having the desired qualities should be made.

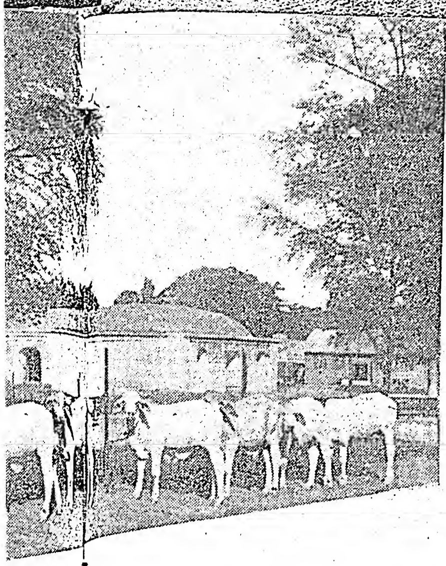
CARE OF THE PREGNANT COW

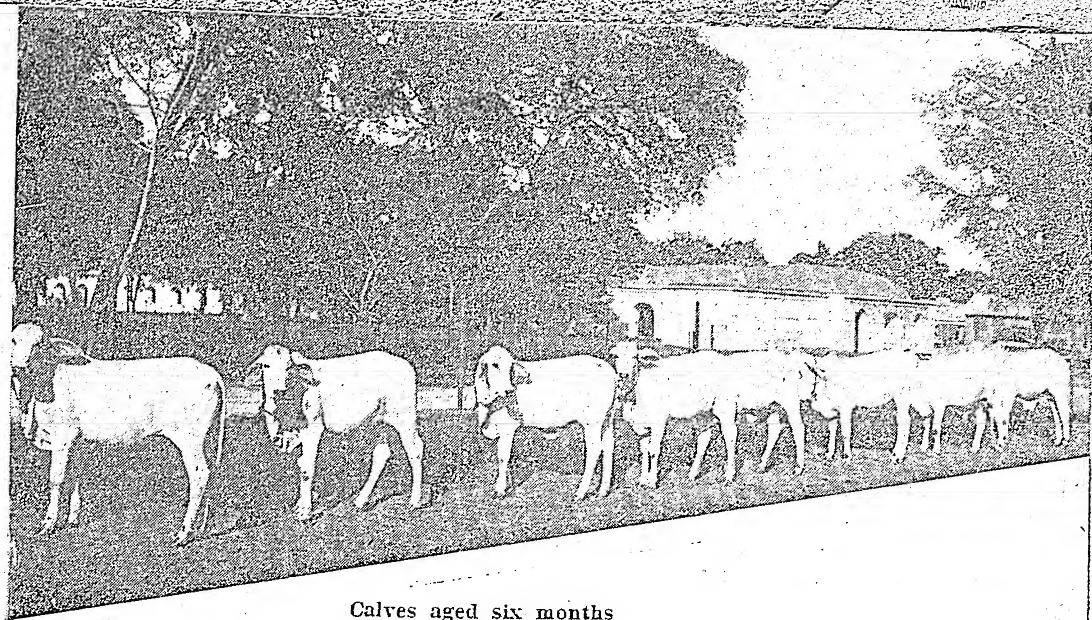
The problem of raising calves begins with the pregnant cow. The dry period of a pregnant cow should be about 60 days. Adequate rest should be provided to the pregnant cow to get a better flush and more milk. Cows can be easily dried by simply withholding their ration and by increasing the interval between milking. During the dry period a cow has to make up the loss of her previous lactation, to meet the nutritional requirements of the growing foetus, and keep in store sufficient body-reserves for the subsequent lactation.

Poor condition at the calving-time lowers the milk production and affects adversely the health of the new-born calf. It also interferes with the normal



Feeding time—calves aged one month





Calves aged six months

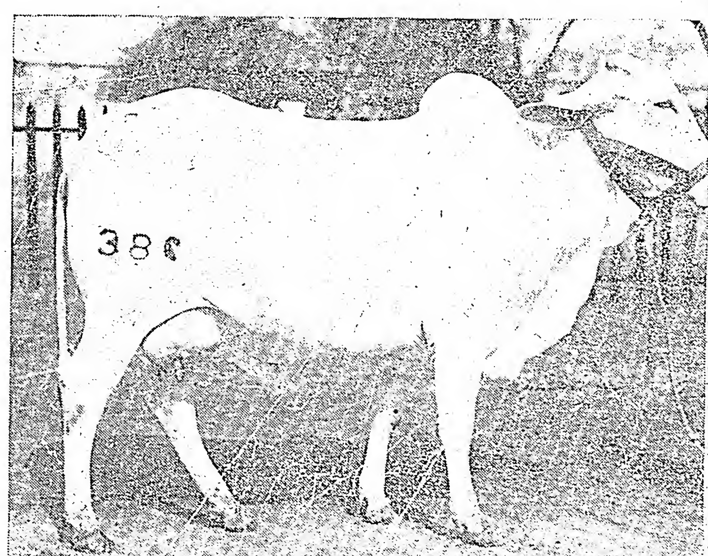
Raising

act of parturition and as a result reproductive disorders usually set in. The dry, pregnant cows should, therefore, be fed with liberal quantities of succulent fodder. A combination of the legume hay such as berseem and a concentrate mixture containing wheat bran, oilcake and gram, not only supplies a good quantity of minerals but also of vitamin D which helps in the assimilation of these minerals. As a general rule, three to six pounds of a concentrate mixture with adequate quantities of hay and succulent feed per day should be given.

CARE OF THE NEW-BORN CALF

Before birth, the young animal is fairly well-protected from shock, injury and infection. It has a practically uniform temperature and under normal conditions its nutritional requirements are met adequately. But once a calf is born, it is surrounded by infectious organisms, variations in temperature and the possibility of inadequate or improper feeding. The danger is greatest at birth, or shortly afterwards. The first 10 days are the most critical period. After six months the task of raising calves is comparatively easy.

As soon as the calf is born, the mucous should be wiped off from its mouth and nostrils with a clean napkin. It is necessary to slap its chest vigorously in order to help the calf to start its respiratory activity, if it is not already respiring. The entire body of the calf should be rubbed dry. Infection may gain entrance into the body of the calf through the navel. It is, therefore, necessary to dip the cord in tincture



Pregnant heifer

of iodine. It is not necessary to cut the cord. If a calf cannot get up within an hour after birth it should be assisted to do so. In the cold weather the new-born calf should be covered with a blanket.

Colostrum or the first milk is rich in antibodies, which are essential for giving protection against infection as well as to encourage the formation of certain blood constituents in the calf. Colostrum has laxative properties and is, therefore, helpful for the first faecal excretions. Colostrum is also rich in vitamins A and D, and nicotinic acid which are essential for the well-being of the calf. Nature has provided for the infant calf colostrum which serves its various needs. The digestive process in the rumen, which is characterized by the development of certain micro-organisms, begins to function after the tenth day of birth.

The natural feed for the calf is its mother's milk. The animals suckled by the mothers grow best and have sleek coats. In large dairy farms it is difficult to feed calves in this manner. By weaning the calves, the cow could be completely milked which would tend to produce a better lactation yield. The young calves could be fed in accordance with their individual requirements. Calves should be fed eight to ten per cent of their body-weight per day.

The attendant should first wash his hands and dip a few of the fingers into a bucket containing milk. The fingers are then inserted into the mouth of the calf which begins to suck the fingers. This process is repeated for feeding the calf. The first feed should be about one pound. At first, there will be some difficulty for the calf to suck the milk but it will get accustomed to it in due course. After the feed a few pinches of common salt should be placed in the mouth of the calf. The mouth and nostrils should be cleaned with a napkin. The hand-feeding should be continued for about four weeks and after that the calf will be able to drink the milk from the bucket without assistance.

In this way, the calf-in-nursing takes milk slowly and mixes it well with its saliva. If the calf is allowed to drink rapidly, it will expand the oesophagus and there is the possibility of the milk getting into the rumen and not going direct into the fourth stomach as intended. When milk gets into the rumen of the calf it will cause undesirable fermentation and would result in unthrifty pot-bellied condition. The young calf has no power for regurgitation.

At an early age the digestive system of the calf is delicate and the capacity of the stomach limited. It differs from that of the adult in the size of different parts; the rumen occupies 80 per cent of the total capacity of the stomach in the adult whereas in the calf the abomasum and the omasum are twice as large as the rumen and reticulum combined. These proportions rapidly change with the advancement of age and when about one year old, the different parts attain the proportions found in mature animals. The fourth stomach of a young calf has a capacity of less than one gallon whereas the mature animal has a capacity of 30 to 70 gallons.

Calves should preferably be fed thrice a day until they are one month old. The interval between feeds should be uniformly maintained. The total amount of the feed should be equally divided among the number of feeds given. The number of times should be reduced to two when the calves are one month old.

The milk for feeding calves should be at the temperature of 95° to 105° F. It is desirable to use a thermometer to determine the temperature of milk as the use of the fingers for this purpose is not very dependable. Sweet and clean milk should be fed as sour or stale milk tends to induce scouring in the young animals. Clean vessels should be used for feeding purposes. A plentiful supply of pure and clean water should be available for the calves at all times. Blocks of salt should be placed in the calf-yard within easy reach of the calves to enable them to lick these whenever they like.

Calves fed as per Table I, mature earlier, and they calve for the first time at 30 months of age, whereas the general average for the Indian breeds of cows to calve for the first time is about 42 months. Intensive production in the form of high fertility and early maturity is dependent on the nutritive level and other environmental conditions.

A young bull raised at the Karnal farm

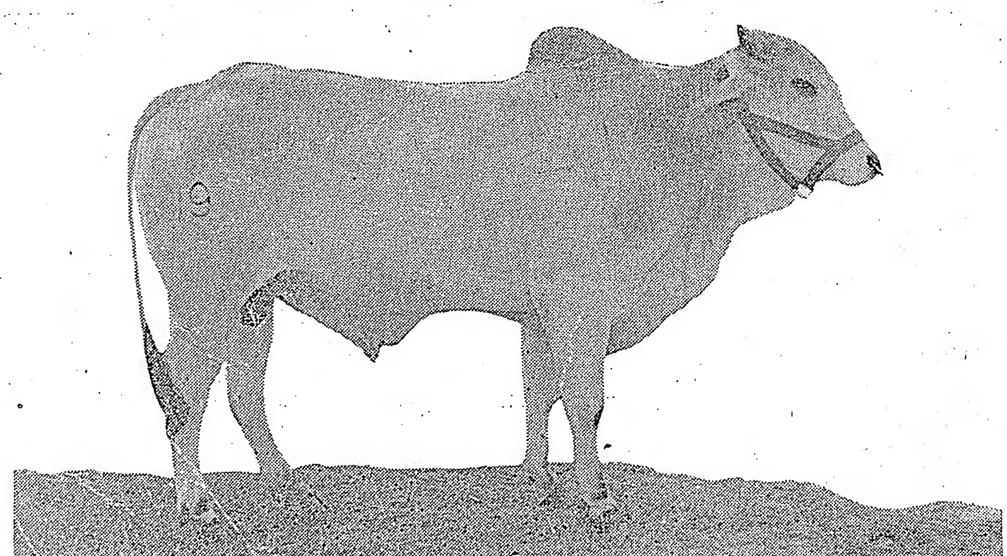


TABLE I

CALF-FEEDING

Calf-rearing on the Standardised Milk 3.5 per cent Fat and Grain.

Age		Milk for female calf	Milk for male calf	Barley water	Grain and Fodder		
					Grain	Green	Dry
1st	week	1/10 of the weight at birth	1/10 of the weight at birth	..	..	..	..
2nd	,,	1 lb.	1 lb.	..	..	..	..
3rd	,,	1½ ,,	1½ ,,	..	..	..	..
4th	,,	2 ,,	2 ,,	..	..	..	..
5th	,,	3 ,,	3 ,,	..	..	..	..
6th	,,	3½ ,,	3½ ,,	¼ lb.	¼ lb.	..	..
7th	,,	4 ,,	4 ,,	¼ ,,	¼ ,,	..	..
8th	,,	4 ,,	4 ,,	½ ,,	¼ ,,	..	..
3rd	month	10 lb.	8 lb.	¾ ,,	1½ ,,	5 lb.	2 lb.
4th	,,	8 ,,	7 ,,	1½ ,,	1½ ,,	5 ,,	2 ,,
5th	,,	6 ,,	5 ,,	2 ,,	2½ ,,	5 ,,	2 ,,
6th	,,	5 ,,	2 ,,	2 ,,	3 ,,	5 ,,	2 ,,
7th	,,	3 ,,		2 ,,	3 ,,	5 ,,	2 ,,
8th	,,	2 ,,		2 ,,	3 ,,	5 ,,	2 ,,

TABLE II

Growth and average daily gain

Age	Male calf	Female calf	Daily gain	
			Male calf	Female calf
8 weeks	96.8 lb.	88.6 lb.	1.0 lb.	0.9 lb.
12 ,,	124.7 ,,	116.6 ,,	1.2 ,,	1.1 ,,
16 ,,	156.0 ,,	147.1 ,,	1.6 ,,	1.1 ,,
20 ,,	188.8 ,,	179.3 ,,	1.2 ,,	1.4 ,,
24 ,,	223.1 ,,	212.3 ,,	1.4 ,,	1.3 ,,
28 ,,	239.9 ,,	250.5 ,,	1.1 ,,	1.4 ,,
32 ,,	....	285.3 ,,	..	1.1 ,,

Bell peppers constitute the mangoes of commerce in Europe and America; the large podded, squarish, subtruncate sweet fruits are used for salad, stuffing and baking

Production of Chillies

By S. S. PUREWAL,
Economic Botanist (Vegetables)
Government Agricultural College, Ludhiana

THE word 'chilli' is Spanish for any kind of pepper, but in India the use of this term is limited to the pungent varieties mostly used after drying as a condiment or spice for culinary preparations. The mild type used for salads, pickles, baking and stuffing is known as pepper, or white pepper of commerce, both of which are derived from the berries of a tropical woody plant, *Piper nigrum,* whereas chilli, *Capsicum frutescens* belongs to the family Solanacee.

The native home of the chilli is considered to be tropical South America, especially Brazil, where it still abounds in a wild state. The chillies were not known in Europe until the discovery of America from where the pungent types were first brought to Europe by Columbus. The plant is not indigenous to India. There is no Sanskrit, Hebrew or Chinese name for it. Its introduction into India is believed to be through the Portuguese. At present the chillies are indispensable and a common ingredient of South Indian dietary and an important condiment throughout the country. Prior to its introduction black pepper was used to incorporate the necessary pungency to the condiments and food preparations.

IMPORTANCE

In spite of its recent introduction, the chilli has become an important crop, grown all over India not only for a huge home market but also for export to other countries. It is extensively grown in the States of Madras, Hyderabad, Bombay and Bihar, covering an area of about ten lakh acres annually. Nearly a lakh maunds are annually exported from India to Ceylon, United Kingdom, Aden, Bahrein Islands, South Africa, Zanzibar and Pemba, Mauritius, Australia, New Zealand and Maskat. About 90 per cent of the total exports of this condiment is directed to Ceylon. It increases the taste of food thus making it more palatable, and is even said to improve digestion when taken in small quantities. But excessive use may cause bowel troubles, such as piles. Curry powder is made by grinding roasted dry chillies with other condiments like coriander, onion and turmeric. The pungency of the chilli is due to capsaicin, an alcohol-soluble alkaloid present in the inner walls of the fruit, the hulls and seeds having almost none till the late stage. The quantity of capsaicin present is considered to be inversely proportional to the size of the fruit, being maximum in the smallest. Capsaicin has many pharmacopoeial uses. The chillies, especially when green, (are an important source of vitamin C.)

CLIMATIC REQUIREMENTS

The chilli plant requires a warm and humid climate for its best growth and dry weather during the maturation of its fruits. The natural habitat of the chilli plant are the tropical and sub-tropical regions, but it has a wide range of adaptability and can withstand heat and moderate cold to some extent, although freezing temperature usually kills the plant. The crop can be grown over a wide range of elevations from sea level up to an altitude of nearly 7,000 ft. The crop is mostly raised under rain-fed conditions where the rainfall varies from 25 to 50 inches, but excessive rains bring about defoliation of its plants.

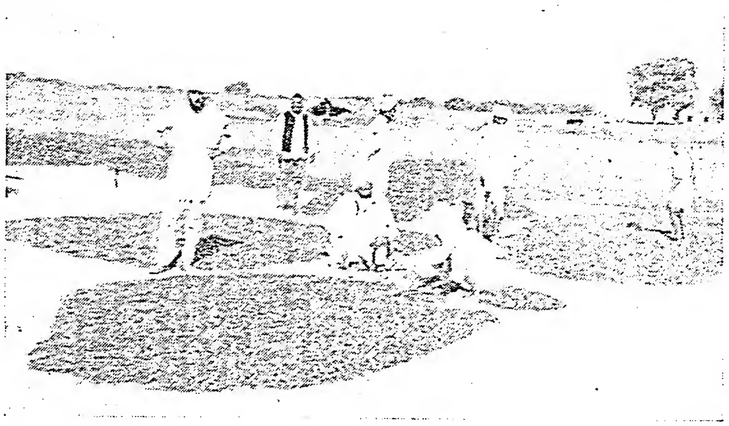
SOWING TIME AND SEED RATE

The crop can be sown almost all the year round where winters are mild and monsoon rains are not very heavy. But for early crop production where winters are severe, the seed is sown in the nursery-bed during the month of November and the seedlings are over-wintered by providing some sort of wind-breaks held in a slanting position facing towards the south. These seedlings are transplanted in the open field as soon as the season warms up and the danger of frost is over. In northern India in the States of the Punjab, P.E.P.S.U., Uttar Pradesh, Delhi and Rajasthan, where irrigation facilities are available, the first sowing is done as soon as

the season warms up during the month of March. For production under rain-fed conditions, the seed is sown in the nursery-bed about six weeks before the setting in of the monsoon, and transplanting is done with the outbreak of the monsoon, i.e. from the end of June to August. In the Gangetic plains it is a cold weather crop and is sown after the monsoons are over. The seeds are sown in the nursery-bed from the month of April to July. Hot-weather crop is sown during the month of February. In the southern States like Bombay where the season is mild, the main crop is sown from May to October. In the South, the main crop is rain-fed and the seeds are sown in the nursery-bed during the months of May-June and transplanting is done by the middle or the end of July.

The Bell Pepper is sown during the summer months of April to June, in the hills for its green fruits that are supplied to the markets in the plains. It can be produced successfully in the plains during the early summer or early winter months.

The chilli seed is very light and counts about four thousand seeds per ounce, and is viable for two to three years. A good-quality seed gives a germination of 80 to 90 per cent and the seedlings raised from 1-1½ lb. of seed are sufficient to plant an acre. When the crop is sown in the field directly from the seed, three to four pounds of seed will be sufficient to sow an acre.

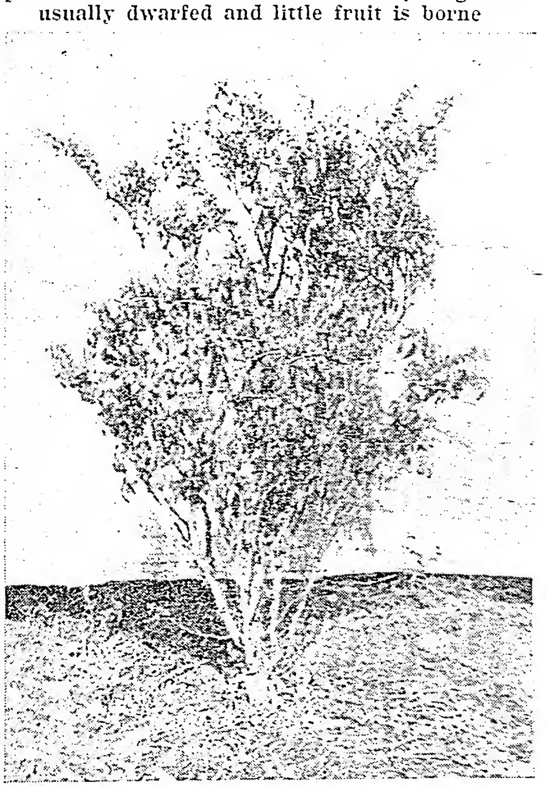


A typical scene in chilli market: open, free from shade and hard ground is used for drying and curing chillies. The woman in the fore-ground is sorting defective fruits and the man on the extreme right is trampling the half-dried fruits

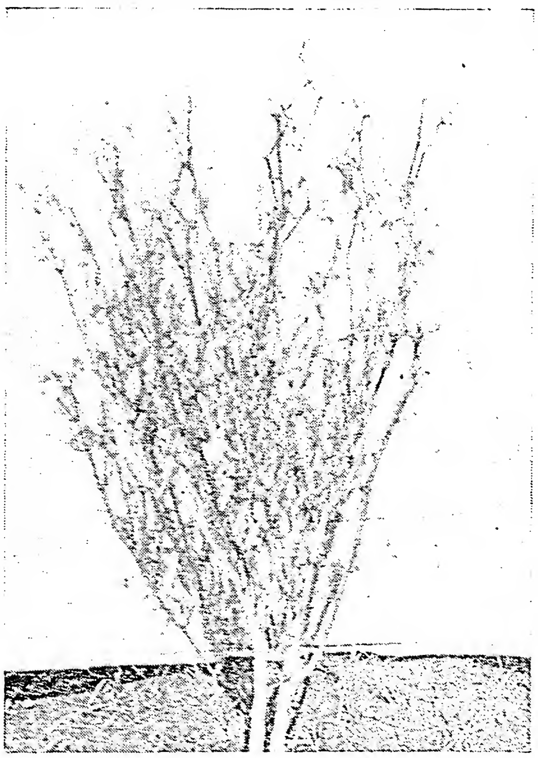
SOIL AND ITS PREPARATION

The chillies can be grown on almost every kind of soil rich in plant nutrients and well-supplied with humus. Clay loam, heavy silt

A virus-infected plant with curled leaves: plants that become infected while young are usually dwarfed and little fruit is borne



A die-back-infected, defoliated plant: the shoots begin to die from tips and infection spreads downwards



and silt loams are, however, considered to be the most suitable for obtaining high yields. For the rainy season crop, heavy, well-drained soils which retain moisture but are not susceptible to water-logging, should be selected. The crop can also be successfully raised on the sandy loams provided manuring is done heavily and irrigation is applied adequately.

The chilli plant has a tap-root that may penetrate into the soil upto 24 inches or more. Hence a deep seed bed is required for successful crop-raising. As soon as the preceding crop is removed, the stubble should be ploughed-in with a furrow-turning plough. The land is ploughed five to six times with an ordinary plough and planked smooth before preparing the seed bed. Well-rotted farmyard manure is added after the first deep ploughing in order that it gets mixed thoroughly with the soil during the subsequent ploughings.

MANURES AND FERTILIZERS

Twenty to thrity cartloads (20 tons) of farmyard manure or compost are required to be added to an acre. The manure should be thoroughly decomposed as fresh manure aggravates the attack of white ants, a serious pest of chillies. In order to reduce the severity of the white ant attack, it is advisable to apply the manure to the preceding crop. The application of sheep-manure is preferred in certain localities and, therefore, sheep should be penned in the field where a chilli crop is to be raised. Fertilizers, especially the nitrogenous ones, increase the fruit yields. Sulphate of ammonia may be applied as a top-dressing at the rate of two to three maunds (164-246 lb.) per acre when the plants have taken roots and are well-established in the field after transplanting. A later doze, four to six maunds per acre, should be given at the time of flowering. Superphosphate at the rate of two to three maunds (164-246 lb.) per acre may be drilled with advantage at the time of transplanting in case the crop is to be grown on sandy loam and loam soils.

VARIETIES

There are many varieties of the pungent types of chillies varying mainly in shape, size and pungency. The fruits when unripe are usually green although types with cream, greenish-yellow, yellowish-orange, purple or purplish-black raw fruits are also met with; in fact, these are the intermediate colour stages from the unripe to the ripe fruits that are generally red or yellow or orange in colour. Long Red, Cayenne, Tobasco, Sunward or Surajmukhi or Suryamukhi, Dhanni, Beguni, Kamranga, Red Cluster, Yellow Sirhandi and Sanauri are some of the pungent types listed by the seed merchants. Improvement work on chillies has been done by the Agricultural Departments in the States of Madras, Bombay, Bihar and the Indian Agricultural Research Institute, New Delhi. The improved types N.P. 46 and 390 are said to be fairly resistant to thrips. For dry chillies, the varieties the fruits of which have few seeds, firm stalk, thin pericarp, bright red colour, glossy appearance and high pungency are more popular with the growers as these fetch a high price in the market. There is a great variation in the size of the fruits—from a small, round or conical pea-seed-sized fruit to about six inches long. Although the pungency is considered to be inversely proportional to the size, the long-fruited types are more popular.

Of the mild or sweet types Bell Pepper, Rubi King, Chinese Giant, Elephant Trunk, Bull Nose, California Wonder and World Beater are some of the better known types.

METHOD OF SOWING

The chilli seeds are either sown directly in the field or they are first sown in the nursery-bed to raise seedlings for transplanting at a later date. When the crop is sown directly in the field, the seed is sown on ridges two to three feet apart and nine inches high. The seed should be sown in lumps of six to seven seeds about $\frac{1}{4}$ in. to $\frac{1}{2}$ in., in ridges eight to nine inches apart, as the seedlings come through the surface better in a group than when they are sown thinly. The first irrigation is given immediately after sowing taking care not to submerge the ridges to avoid hard crust formation and consequent obstruction to the germinating seedlings. The second irrigation may be given four to five days after the first one. The seeds germinate after about a week.

For raising seedlings the seed is sown in a heavily-manured and well-prepared nursery-bed which has been laid out in small plots convenient for irrigation and weeding without entering the plot. The seed is sown about six weeks before the transplanting time, and in this way it is possible to get the seedlings earlier under controlled conditions in order to raise an early crop. The nursery seed bed is prepared in a sandy loam soil well-supplied with humus. The level of the nursery plot should be at least six inches higher than the ground level. The soil should be sterilized with formaldehyde or steam. Two inches of leaf-mould or compost manure should be mixed in the top-soil of the bed and the soil should be worked to a good tilth before putting in the seed. The seed is lightly covered with a $\frac{1}{4}$ in. layer of manure. The seed-bed is irrigated immediately after sowing using a fine spray from a sprinkling can. The nursery-bed is watered every day till the seeds germinate, and watering is so arranged that the bed is kept just moist and not too wet.

Black ants carry away seeds and do a lot of damage to the germinating seedlings. These should be effectively controlled by dusting gammexane (B.H.C. five per cent) on the boundaries of the nursery bed. An area of 800-1,000 square feet is required to sow $1\frac{1}{2}$ lb. of seed to raise enough seedlings for an acre. The seed germinates after six to ten days of sowing depending upon the temperature, and the seedlings when six to nine inches high, usually within a period of four to six weeks, are ready for transplanting. To raise vigorous seedlings ammonium sulphate solution (one ounce in one gallon) should be applied when the seedlings are about two inches high and again after a couple of weeks. Over-crowding and excessive watering should always be avoided. The transplanting should always be done in the evening followed by watering where irrigation facilities are available. Under rain-fed conditions the transplanting is usually done before or after the rains, but it is advisable to do the transplanting when the rains are expected and the plants, after setting, should

be watered with the sprinkling can to avoid heavy mortality.

IRRIGATION AND WEED-CONTROL

Frequent waterings are required to be given to the early crop during hot, dry weather and irrigation should be given every 4th or 5th day. During the winter months, irrigations may be given once in every two weeks or so. Weeding is very essential especially of the rainy season crop. The weeds should never be allowed to compete with the plants and should be removed before they overpower the crop. Weeding may be done as frequently as required but cultivation beyond that necessary for weed-control may do more harm than good, especially if practised late and comparatively deep after the plants are well-established. In all, three to four weedings during the early stages are sufficient.

HARVESTING

The country types are mainly grown for ripe fruits, but from the early sowings, the first flushes of fruits are usually plucked green to stimulate further flushes of flowering and fruit-setting. The first picking is done about two months after transplanting. The subsequent pickings are done when the fruits are fully ripe and change from green to red or yellow or orange in colour and are still plump and glossy in appearance. The plucking is done with hands. The fruits along with the peduncle are severed gently from the plants and are gathered in baskets by the pickers.

The crop continues to flower and fruit till the onset of winter and plucking of fruits continues till December. In the South, pickings may go on up to the end of February. Usually the fruits are picked fortnightly and in all six to ten pickings are done.

The mild types come to flower after about $1\frac{1}{2}$ months of transplanting. The fruits are fully developed within a month's time and should be plucked before they begin to change colour. More frequent pickings are to be done in the case of the mild types than in case of country types.

YIELD

The yield of undried ripe fruits varies greatly with the condition of the crop. The average yield under rain-fed conditions varies from 250-1,000 lb. per acre and for irrigated crop from 1,500-2,500 lb. per acre, but yields as high as 6,500 lb. per acre are not uncommon. The proportion of dry to fresh-ripe chillies varies from 25 to 40 per cent depending upon quantity of seeds and the thickness of the inner wall or the pericarp of the fruit.

MARKETING AND STORAGE

The growers usually sell their produce in the fresh condition soon after picking. The plucking is done when the fruits are fully ripe. It is, therefore, advisable to take the produce immediately to the market before the fruits lose their bright colour and glossy appearance. Moreover, the loss in storage due to evaporation will also be considerable. In some parts of the country, the produce is smeared with *mohua* oil (Madhuca longifolia) to impart glossiness. The produce is dried in the markets by spreading it over the drying floors or roofs of houses. The heaps are spread in thin layers and frequent stirrings are given during the day time so that the drying is uniform and there is no discolouration or mould growth. The drying fruits are heaped in the evening and covered with tarpaulin or gunny bags and are spread again in the morning till the fruits are almost completely dry. When half-dried they may be slightly trampled over to flatten the fruits to facilitate drying and packing in gunny bags. The dried chillies are marketed in bags whereas the fresh produce is taken to the markets in baskets, bags or carts. The fresh produce should not be heaped for any considerable length of time to avoid the rotting of fruits. The mild types should be taken immediately to the market without exposing them to the sun. They are always carried to the market in baskets. Slightly under-ripe chillies can be ripened artificially by stacking them indoors for two to three days when the fruits will develop full ripe colour. The best temperature for ripening is 71° F to 77° F.

DISEASES AND INSECT PESTS

By far the most serious disease of the chillies is the leaf-curl or mosaic caused by a virus. It is characterized by the curling of margins of leaves inwards or up-

(*Contd. on page 32*)

FIGHTING FAMINE AND DROUGHT BY SIMPLE MEANS

(*Contd. from page 11*)

TIMELY TILLAGE

The fields should be immediately ploughed-up after harvesting the *rabi*-crop with a soil-turning plough. This practice should be regularly followed, say once in a month, by using a *desi* plough or some other light plough during the summer months when the land is generally kept fallow. During the rains, the fields should invariably be covered with crops, preferably green-manuring legumes. One of the most effective measures for fighting famine is to cultivate hundreds of acres of the fallows at present maintained in villages, and grow quick-maturing legumes in them, viz. Moong T1 or Lobia T1. These crops generally flourish even under scanty moisture conditions and produce valuable food and at the same time add to soil fertility. The monsoon fallows, on the other hand, produce nothing but require several ploughings and keep the farmer and his bullocks engaged unnecessarily. These legume crops ripen by the end of August when they should be immediately ploughed-up into the soil after picking the ripe pods. Turning-in of these legume crops into the soil should, under all circumstances, be carried out at the latest by 7 September, even if the cultivator has to lose some unripe pods. Late ploughing-in of the green-manure crops depresses the yield of the following *rabi* crops and thus results in heavy losses to the cultivator.

Ploughing of the fields, particularly the last ploughing, should be carried out across the slope and along the contours of the land instead of cutting furrows up and down the slope or hill-sides. This will help the rain-water to soak into the ground and get conserved.

PROPER AND TIMELY APPLICATION OF MANURES

The application of organic matter and manures to the soil is also a very important practice to fight drought. Their application increases water-retentive capacity of the soil and helps conserve moisture.

The ploughed land should receive at least five to ten cartloads of farmyard manure or compost per acre. The application of manure should be carried out before the start of the monsoon and should be immediately followed by ploughing.

Application of superphosphate, say at the rate of 40 lb. P_2O_5 per acre, also gives encouraging results. Superphosphate in no case should be applied on the surface but about three to four inches below the surface layer of the soil by means of a furrower or a seed-spout fitted behind a *desi* plough.

SUITABLE ROTATIONS, VARIETIES OF CROPS AND FRUIT CROPS

The crops or varieties which are resistant to drought should be grown. For *kharif*, such crops are *jowar, bajra,* Moong T1, maize and *arhar,* and for *rabi,* gram, barley, *duan* (*tara mira*), etc. Wheat can only be grown successfully if adequate rains are received in August and September and the soil is capable of retaining moisture. There are certain varieties of paddy in the eastern districts, viz. Satha, Bagari white and Bagari black, which require comparatively less moisture as compared to other varie-

(*Contd. on page 29*)

COMPARATIVE PERFORMANCE OF SOME OF THE NON-LEGUME FORAGES IN THE PUNJAB

By H. C. MALIK,
Assistant Economic Botanist (Fodder), Sirsa

THE period from April to June is not only the hottest and the driest period during the whole year but is most important from the farmer's point of view for carrying out the various agricultural operations. He has to harvest the crops like wheat, gram, barley, berseem and lucerne and complete their threshing and cleaning prior to the advent of the monsoon season. He has also to undertake sowing of cotton, etc. during this period. It is, therefore, apparent that his working cattle are put to a very great strain at this time. Besides, the yield of milch cattle, especially the buffaloes, decreases considerably due to severity of heat and lack of green forage. Berseem, the ideal winter forage, is almost over. Even if it sprouts and gives a cutting at this time, its quantity and quality are both greatly reduced. Other forages like late-maturing oats remain green to some extent up to early April after which they dry and do not provide superior quality forage. In view of this, any crop which provides green fodder at this period is of great significance.

There are a number of crops which would grow and provide green forage at this period, for example, sorghum (*jowar*) and *bajra* from the existing crops and Sudangrass and Teosinte from the new introductions. Sudangrass is a summer annual which grows rapidly, and even in dry season there is more certainty of getting a crop from it than from any other forage. It can tolerate long hot and dry periods of weather and is particularly suited to the arid conditions. Sorghum and millets (*bajra*) are crops that would tolerate and grow under these conditions but with slight variation. In fact, sorghum is the most dependable forage in the main *kharif* season from July to September. It is productive even under low rainfall conditions and is superior to all the other forage crops in the Punjab State. *Bajra* excels sorghum in drought resistance, but is grown primarily as a grain crop, the by-product of which only is utilized as cattle roughage, as its green forage is not so palatable. Teosinte (locally known as *makchari*) is another coarse annual, suitable for growing in the summer season. It grows 3-12 ft. high, and unlike maize it tillers profusely. It is closely related to corn but requires a rich soil and a long season of moist hot weather for its best development. If cut at the young stage, i.e. when 4-5 ft. high, it gives two cuttings of forage in the season.

All these crops can give more than one cutting of green forage under favourable conditions of soil and irrigation. Sudangrass is

Sudangrass

quick-growing and gets ready for harvesting for the first cutting in about 50 days after sowing, and later on after about 30 to 40 days, giving two to three good cuttings in the season. *Jowar* is next in order of growth to become ready in about 70 days after sowing. It usually remains stunted in growth and gives one cutting of green forage, but an early-sown crop may give another cutting with adequate supply of irrigation and rain. Teosinte grows slowly and its growth is generally stunted to start with in this period, but it makes a luxuriant vegetative growth later during the rains.

EXPERIMENTS AND RESULTS

An experiment to study the comparative performance of these non-legumes, viz. Sudangrass, *jowar* and Teosinte, primarily for the early *kharif* season, was started in 1947-48. *Bajra* was also included in the next two years, viz. 1948-49 and 1949-50, because of its very quick growth and high drought-resistant quality, though the quality of its green forage is much inferior to the three crops mentioned above.

The trials were laid according to the randomized system of field trials for a period of three years on a well-prepared soil using the usual seed rate of about 10, 15 and 20 seers per acre, respectively. Seed rate of *bajra* in these tests was about 2.5 seers per acre.

There was great variation in the forage yield of the crops under comparison, not only amongst themselves but also from year to year. In the case of crops sown very early in the *kharif* season, i.e. in the middle of March on 14-3-47 in 1947-48, Sudangrass gave the highest total forage of 804.7 maunds per acre in three cuttings taken during the season up to the beginning of November. *Jowar* gave only one cutting, yielding only 307.7 maunds of forage per acre. Teosinte gave 608.8 maunds per acre in two cuttings up to November.

When crops were sown in April on 8-4-48, two cuttings were obtained from Sudangrass, *jowar* and *bajra* up to August and one cutting from full-grown Teosinte in July. In this case, the highest forage yields were secured from *sorghums*, giving 994.6 maunds per acre, followed by *bajra* giving 894.7 maunds per acre and Sudangrass, 622.4 maunds per acre. Out-turn of Teosinte in one cutting was 836.7 maunds per acre. Yields were very high in all cases as the crops grew during the monsoon season.

During 1949-50 the sowing was possible on 4-5-49. The crops made a luxuriant vegetative growth because of the increase in humidity due to monsoons during their growth period. In this case, *jowar* was superior to other non-legumes, giving 858.3 maunds of forage per acre, followed by *bajra* yielding 794.4 maunds per acre in two cuttings up to August-September. Sudangrass gave two cuttings up to August and yielded 764.4 maunds per acre. Teosinte yielded 729 maunds in one cutting in July when it had completed its growth.

If the period of growth of each crop is taken into consideration, it will be observed that Sudangrass was ready for harvest first of all, followed by sorghum, *bajra* and Teosinte, respectively. Sudangrass made a quicker growth than the other non-legumes in the dry and hot conditions that prevailed prior to the advent of monsoons. *Jowar*, *bajra* and Teosinte grew well but invariably their leaves showed signs of drying at this stage. *Jowar* and *bajra* recovered well but Teosinte, on account of its slow growth, could not give high forage returns unless allowed to grow till the rains were received.

It is, therefore, in the interest of the farmer to make use of Sudangrass for providing green forage in the dry and hot period prior to the advent of rains, but later on sorghums and Teosinte will grow quite well and yield high tonnage of green stuff. As regards quality of forage, sweet sorghum was superior to the other non-legumes but Sudangrass and Teosinte were preferred to *bajra* by cattle.

MAN OF THE MONTH (Contd. from page 6)

and 25 respectively, a pair of hard working young farmers, who lend support to all the progressive actions taken by him. Self-taught and hard working, this farmer knows that it pays to be cooperative and does not ignore the ideas conveyed to them by the field workers of the Agriculture Department.

THIS IS PROOF POSITIVE!

In a State where soil fertility is questionable and the rainfall problematic, the farmers have to fight the elements all the time and so when they take to new methods, they take to them fully prepared to face the consequences in the case of a failure. The method has not been fully tried by the State Government, especially from the point of view of its economics. There is one reservation made, however. As stated by the State Director of Agriculture, when the experiment was first done near Nadiad by a Gujarat cultivator in summer, about 100 cartloads of farmyard manure per acre was applied. The additional cost of manure and irrigation on account of this excessive dose made the raising of that particular crop uneconomic. However, the residual effects made the succeeding crop highly economic. So far as Bhadabhai is concerned, the dose of manure given by him was moderate. And, because the crop was raised in the *kharif* season, his cost of irrigation was also small. These two factors made his crop very economic.

Mota Gundala is fortunate in having leaders like Bhadabhai. I came away from this village feeling that here is an example in village management and spirit of progressiveness worth emulating!

POULTRY LICE - - - (Contd. from page 13)

the bird in this solution, holding the wings over the back with one hand and ruffling the feathers with the other when the bird is below the surface of water. Duck the head once or twice, take it out and hold it for a moment on the tub to receive the draining solution and then let it go. One hundred birds will use up approximately five gallons of the dip; sufficient material should be available at the start of operations to maintain the original strength of the dip.

The dip is to be given on warm and sunny days, so that the treated fowls may dry up quickly. Very weak and young birds should not be dipped in cold and damp weather. The dipping method kills all lice immediately but where the chemical is applied as a powder, it requires three to four days for a complete kill. If the birds are caught and handed to the operator, 100 to 125 birds an hour can be treated by dipping or dusting, and approximately 60 to 75 per hour by the "pinch-method". It would be necessary to repeat the control measures after about a week to complete the eradication.

COST OF TREATMENT

Generally, treatment with one of the modern residual insecticides like DDT or BHC will cost approximately six pies per bird. Derris root powder which also gives satisfactory results but has less residual effect will cost slightly more than half an anna. Of all the insecticides, sodium fluoride is the cheapest and the cost per bird by the dipping, dusting and pinch-methods will approximately work out to 1.2 pies, 6 pies and 2 pies, respectively. The cost of all these treatments can still be lowered if the insecticides are obtained in bulk.

Ford Motor Company of India Limited ANNOUNCE THE APPOINTMENT

OF

UNITED PROVINCES COMMERCIAL CORPORATION

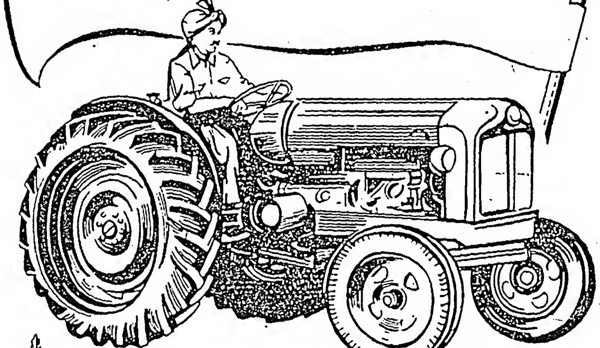
53, RADHABAZAR LANE, CALCUTTA 1

AS ALL INDIA DISTRIBUTORS OF FORDSON MAJOR TRACTORS, IMPLEMENTS & SPARE PARTS

Introducing MAJOR FARMING

WITH THE NEW FORDSON MAJOR

- ★ Famous for over thirty years of power application to the land
- ★ Produced through accumulated experience
- ★ Stand all conceivable tests of durability
- ★ New system of forward and reverse gears; over-head valve engines; new hydraulics with gear-type pump, scientific ranging, easy controls and steering
- ★ Easily handled ● silent operation ● full driving comfort ● low height ● wide clearance
- ★ Built and designed by Ford—backed by unequalled resources and research!



UNITED PROVINCES COMMERCIAL CORPORATION

53, RADHABAZAR LANE, CALCUTTA.

U.P.C.C EVERYTHING FOR THE FARM

ALL INDIA DISTRIBUTORS FOR

FORDSON MAJOR TRACTORS

FACTS AND FIGURES:

There are	•	700,000 Fordson Tractors operating in the world.
There are	•	290,000 Fordson Tractors operating in the U. K.
There are	•	150 Fordson Tractors being produced everyday at Ford's Plant in Dagenham.
There are	•	3,500 Fordson tractors in India (of these 50 p. c were sold by U. P. C. C.)

AUTHORISED DEALERS

Calcutta Region

United Provinces Commercial Corpn.
53, Radhabazar Lane, Cal.-1.

James Warren & Co. Ltd. Dibrugarh.

United Provinces Commercial Corpn.
Exhibition Road, Patna.

Delhi Region

British Motor Car Co. (1934) Ltd.
Connaught Circus, New Delhi.

Zamindara Engineering Co.
Ahuja Mansion, Fazilka.

Northern India Machinery Corpn.
Jammu.

Pritam Farm Equipment Co.
131-A, Civil Lines, Bareilly.

Sanghi Bros. (Indore) Ltd.
Post Box No. 1, Indore City.

Sanghi Bros. Jodhpur.

Provincial Automobiles Co.
Kingsway, Nagpur.

Bombay Region

United Motors India Ltd.
39, Hughes Road, Bombay 7.

Cama Motors Ltd.
Lal Darwaja, Ahmedabad.

Kalyanji Dhanji & Co.
Kalyan Bhuvan, Kutch Mandvi.

Western Motors Ltd. Rajkot.

Automotive Manufactures Ltd.
8571, Rashtrapathi Road,
Secunderabad (Dn)

MAJOR FARMING THAT LEADS IN VALUE

PPS/UP/42

 (Contd. from page 24)

ties of paddy. The area under these varieties of paddy should be increased in the main paddy-growing tracts. Even among the late varieties, early-maturing types, viz. N.105, N22A and Desi Karngi, require less moisture than the more important late varieties. Early varieties of paddy should invariably be sown mixed with *jowar*-seed at the rate of about one seer per acre. If there is abundant moisture and paddy grows well, the *jowar*-plants can be fed to cattle. On the other hand, if paddy suffers from drought for want of moisture, *jowar* will certainly yield a fair quantity of grain to the cultivator.

Care has to be taken in selecting the proper seed. It is important to make sure that the seed to be sown was actually produced and adapted to a dry climate, as the seed produced in humid areas is adversely affected by drought conditions.

Among the suitable crop rotations recommended for such areas are:

Kharif	*Rabi*
Jowar	*Arhar*
Arhar	Groundnut
Arhar	Moong T1
(*Arhar*—groundnut)	Cane
(*Arhar-Moong* T1)	Cane
Arhar	Lobia
(*Arhar-lobia*)	Cane
Bajra	*Arhar*
Jowar or *bajra*	Gram
Moong T1	Wheat
Lobia T1	Wheat

Among these rotations the 2nd, 3rd, 4th, 5th, 6th and 7th are the most important ones. In these rotations, *arhar* is sown in lines nine feet apart. In between the *arhar* rows, groundnut, Moong T1 and *lobia* crops are sown in lines 1½ ft. apart. These intervening crops are all leguminous and of spreading nature. They not only add nitrogen to the soil, but provide enough food and act as a cover for the soil in the rainy season helping to conserve the soil and soil-moisture by preventing loss through surface run-off and evaporation to a considerable extent. Good crops of *arhar*, groundnut, Moong T1 and *lobia* can yield as much as 15 md., 20 md., 10 md., and 15 md. of grain, respectively.

There are certain fruit trees such as *ber* (Zizuphus), *bel*, *amla* and dates which can quite successfully resist dry conditions. Their plantation by individuals or on community basis can provide enough relief in years of scarcity by way of some food as well as some continuous income year by year once the plantations attain full growth.

METHOD OF SOWING

The sowing of crops in areas of low rainfall and drought should generally be done in lines with increased spacing between rows and with a reduced seed rate. The sowing should be done at a depth of three to four inches below the surface so as to ensure that the seed has fallen in a moist ground. The sowing should preferably be carried out by bullock-driven seed-drills or with a *desi* plough having a funnel attached to a hollow bamboo for sowing the seed. This will ensure that the seed falls into a moist layer. A good, healthy seed should always be sown.

For the *kharif* crops like *jowar*, maize and *bajra*, the rows may be 15-18 in. apart and for *rabi* crops like wheat, gram and barley, the distance may be about 9-12 in. Thinning should be carried out in the case of *kharif*-crops when they are about six inches high so as to remove the weaker plants. This will ensure the supply of available moisture to the remaining plants.

By increasing the spacing between the plants and decreasing the seed rate, the plant population per unit area is decreased. Individual plants, therefore, get more space to grow and more area to draw moisture and nutrients. In the case of *jowar*, the optimum condition has been found to be ¾th the normal seed rate and 15 in. spacing between the plants. The sowing should always be carried out across the slope.

Experiments have also proved that ploughing the fields after the first shower with a heavy plough such as Victory or Punjab or U.P., and then sowing in lines followed by periodical interculturing gives better yields than ploughing by the *desi* plough accompanied by broadcast-sowing. The reason of high yields after ploughing with a heavy plough can be attributed to better absorption and retention of moisture of the soil.

PROPER INTERCULTURING

Interculturing is an important operation in fighting deficient moisture conditions. It creates a blanket of loose soil on the surface of the field so as to prevent cracking and loss of moisture by evaporation. It also helps in destroying weeds which compete with the crops for moisture and soil nutrients. Proper and timely interculturing may mean considerable reduction in the water-requirement of crops.

The sowing of crops in lines is a prerequisite to proper interculturing. The intervening space between rows of the crops should be thoroughly hoed with a suitable hoe like the Akola hoe and the cultivator. In the case of *rabi* crops, in which these hoeing implements cannot be used, the lever or triangular harrow may be used in the standing crop till it is five to six inches high. Interculturing with a hoe, harrow or *khurpi* is a very essential practice in fighting drought and should be regularly and properly done after every 10 to 12 days, and also after every shower, as far as possible.

STRIP-CROPPING

The practice of strip-cropping is a very suitable practice for uneven and sloppy areas and consists in growing of erosion-resisting crops as groundnut, Moong T1 and Lobia in narrow strips alternatively with the broader ones of the erosion-permitting main crops such as *bajra* and *jowar*. The erosion-resisting crop acts as a cover for the soil during the rainy season, and thus helps in conserving the soil particles, soil

fertility and soil moisture by preventing loss through run-off to a considerable extent. Such crops sown in strips alternatively with the main crops check the running-off of water of even the heaviest rains, allowing it to spread before it can develop enough momentum to carry away the top-soil.

Suitable contour strips of erosion-resisting crops may even obviate the necessity of bunding in the areas having gentle slopes and widening of the gaps between the bunds in areas having steeper slopes.

CULTIVATION OF SUBSIDIARY CROPS

To ensure food supply in famine areas, it is always advisable to raise heavy-yielding crops and fruits, like potato, sweet potato, tomato, turnip and papaya, which will feed the cultivator's family from comparatively a small portion of his holding, in case the grain crops suffer heavily from drought and there is shortage of cereals.

Though these heavy-yielding crops and fruits cannot altogether replace the cereal diet, they can at least supplement it and thus relieve the pressure on cereals. Small areas near the wells, ponds and tanks can be easily grown with these crops. A few papaya trees, for example, do not require much land and can easily be grown in front of the house, near the well, pond, or tank, or on the corners of fields.

DIGGING AND DEEPENING OF TANKS, PONDS AND RESERVOIRS

No surplus rain-water should be allowed to be drained off to rivers or drains. It should normally be collected in ponds or tanks or reservoirs specially constructed for this purpose. Already existing tanks should be deepened so as to meet an emergency. These tanks can also be utilized profitably for raising crops like *singhara* and rearing of fish.

NOTICE

Dear Subscribers,

We invite your kind attention to the renewal notice posted by us last month. Please remit your subscription charges including arrears if any at an early date. Your subscription number may be quoted in all correspondence.

Business Manager

HARVESTING AND PREPARATION OF GROUNDNUTS FOR MARKETING IN MADHYA PRADESH

By S. G. KOLTE,
Economic Botanist to Government, Madhya Pradesh

THE importance of groundnuts in the agricultural economy of Madhya Pradesh is very great indeed, for it is both a cash crop as well as a good rotation crop with cotton. It is, therefore, necessary that scientific knowledge about its cultivation and marketing should be spread among the growers so that they may be able to earn maximum profits from its cultivation.

The groundnut is principally grown in the cotton districts of the State. However, small areas are also devoted to it in the wheat and rice tracts. It is primarily a monsoon crop and is grown generally without irrigation. Sowing normally begins towards the end of June or early July. Under normal conditions, the crop gets ready for harvesting in fourteen weeks from the sowing time. This is especially true of the small-seeded varieties, like the Small Japan, AK 12-24 and Spanish peanut. On lighter soils the last-named variety ripens even a week earlier than the others. The large-podded types, viz. AK. 10 and AK. 8-11 mature ten to fifteen days later. As a general practice, the pods are sold green as soon as they are plucked from the plants which have not reached the stage of full maturity usually indicated by the general yellowing of the foliage and shedding of the lower leaves. The only incentive to this undesirable practice is provided by a slightly higher price ruling in the market in the beginning of the season when the stocks with the crushers are at their lowest. In order to attract large quantities at the beginning of the season they invariably offer a little higher price. But with the increase in supply the price falls almost precipitously and not infrequently to an extent which more than makes up the merchants' loss incurred by them by way of offering a higher price. The cultivators are, therefore, the ultimate losers.

Green pods do not contain more than 40 per cent moisture when produced on heavy or medium soils. They contain even less moisture when produced on lighter soils. But the price offered in the markets for green pods is generally about 50 per cent less than that for completely dry pods. Therefore, ten per cent is lost in value by marketing groundnuts green or in fresh condition.

Deductions at the rate of four to ten pounds per bag of one maund are common for earth, stones, immature pods and lack of clealiness of the produce. This loss from refractions, therefore, exceeds six per cent.

The expenditure on handling and other marketing expenses is doubled; the same could be saved to the grower if the produce were marketed after drying and removing impurities. These expenses reduce the income of the grower in the end.

It is stated that the hurry to sell groundnuts in the green condition is chiefly due to the shortage of money which the cultivators need badly for cotton-picking and other calls. This is only true in part, for a number of well-to-do cultivators sell groundnuts in their fresh condition due to lack of space for drying them and for fear of theft if these are dried in the fields.

The groundnut plants with pods dry rapidly after harvesting if exposed to the afternoon sun. Within five days no less than 30 per cent of the moisture evaporates and then plucking can be done easily. Extra five to seven days' watching in the field itself costs very little to the grower who employs watchmen for a month and a half in the season, as compared to the increased return that he will get by selling the pods dry.

Apart from the monetary losses mentioned above, the harvesting of groundnuts in comparatively green condition does not renovate the soil, as is the chief characteristic of all leguminous crops, because of the reasons given hereafter; and there is no wonder that some of the cultivators complain that groundnut is a soil-exhausting crop. By harvesting earlier than fourteen weeks, the crop does not get time to shed as many of its lower leaves as it does normally and, therefore, the soil is left poorer in organic matter normally obtained from this source. Moreover, the roots and rootlets of the green plants are comparatively stronger and when pulled out, bring with them out of the soil the attached root-nodules which instead of remaining in the soil, as they usually do, are lost to the land in this way. On the other hand, when the plant has matured properly, the rootlets and the nodules attached to them naturally become weak, and with the soil beginning to get dry after the cessation of rains at the proper harvesting time, this valuable treasure of atmospheric nitrogen and its fixers remain in the ground.

By harvesting the groundnuts before maturity, the tops do not make good fodder, as the large percentage of moisture present in the plants is likely to cause excessive fermentation, and unless the harvested plants are frequently turned, these are likely to get spoiled. The groundnut fodder gets spoiled if rains overtake the harvesting operations or follow soon after. Excellent fodder is made from the vines when harvesting is done at the proper time. The fodder is cured green with its characteristic aroma and is highly nutritious for animals who greatly relish it in the summer months.

From the foregoing description it would be seen that lifting of groundnuts early in compa-

ratively green condition before these are fully ripe, is economically unwise and agriculturally fatal. Big purchasers are reluctant to purchase green groundnut pods for fear of possible fermentation in the course of drying and rains overtaking the drying operation in the compounds. This is because the oil obtained from such deteriorated material is dark in colour and rancid, fetching a lower price in the market. The oilcake in this case also sells at a very cheap price.

PRODUCTION OF CHILLIES

(*Contd. from page 23*)

wards and crumpling of intervenous areas. In case of a severe attack the leaves usually fall off as a result of which the plant growth is obstructed and the fruits get truncated or curled at the stylar end. Once the infection gets into the plant it is not possible to eradicate the disease. The disease is usually spread through insect vectors such as thrips, aphids and mites. Therefore, to check the spread of the disease efforts should be made to control the vectors. Spraying with contact-insecticides such as nicotine sulphate solution, 1 : 1000 parts of water, and soap solution, 1 : 40 parts of water, is effective to control thrips and aphids, respectively. Mites may be controlled by dusting the attacked crop with a mixture of sulphur lime in the ratio 1 : 5. Care should be taken to select the fruits from the healthy plants for next year's sowings. Vigorous growth of the plants should be maintained with the application of fertilizers.

The chilli plant is also attacked by fungus diseases such as die-back and anthracnose. The die-back is characterized by the drying-up of the branches from top and spreading gradually downwards. Moist weather, shade and heavy dew are favourable for the spread of the disease. Spraying with Bordeaux mixture is considered to be an effective check to some extent.

Anthracnose attacks young and immature fruits causing them to drop. The fungus permeates the seed-cavity and infects the seed. To check the further spread of the disease, the infected fruits should be promptly picked and destroyed.

SEASONAL PESTS OF CROPS

(*Contd. from page 10*)

good results. The following alternate control measures can also be adopted on a field scale to subjugate the pest:

(1) In small plots the caterpillars of the first brood may be hand-picked and destroyed by ence of the pest later in the season. searching the soil round the base of plants cut by them. This operation will certainly reduce the incidence of the pest later in the season.

(2) Baiting may be done against the caterpillars by using the following formulations. The bait should be scattered on the surface of the soil making sure not to drop it on the leaves of any plant. The quantity of the bait will vary from 10 to 20 lb. per acre according to the dgree of infestation and should be scattered in the evening. It may be necessary to repeat this process more than once to obtain satisfactory results

Wheat bran	100 lb.
Sodium arsenite, white arsenic or sodium fluosilicate	4 to 6 lb.
Water	Enough to moisten

or

Wheat bran	100 lb.
Paris green	2 lb.
Water	Enough to moisten
Molasses	2 qt.

(3) In the case of tobacco and other crops that are first sown in a nursery seed-bed, dipping the top and the stem (not the root) of the plants at the time of transplantation, in Bordeaux mixture mixed with six pounds of lead arsenate or three pounds of calcium arsenate to 100 gallons of water will give satisfactory results.

(4) Dusting with six to ten per cent DDT or two per cent gamma-Benzene Hexachloride or calcium arsenate at the r[illegible] of 10 to 15 lb. per acre accordin[illegible] o the degree of infestation will also yield satisfactory results. Great care has to be taken in the use of these dusts. Ordinarily, this should be done only under expert supervision.

(5) Dusting of DDT five per cent with some pyrethrum sold in the market as G-205-P or toxaphene five per cent has been found to give excellent results in potato fields. Many cut-worms come in contact with the insecticides and die. The damage caused to potato tubers is thus reduced and the yield is increased. These insecticides should, however, be used with great caution and under expert supervision.